FIGURE 20
126 PAGES

SEQUENCE LISTING

<110> ECOPIA BIOSCIENCES INC.
Farnet, Chris
McAlpine, James
Zazopoulos, Emmanuel
Bachmann, Brian
Piraee, Mahmood

<120> FARNESYL DIBENZODIAZEPINONE, PROCESSES FOR ITS PRODUCTION AND ITS USE AS A PHARMACEUTICAL

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<151> 2003-01-21

<150> USSN 60/492,997
<151> 2003-08-07

<150> USSN 60/518,286
<151> 2003-11-10

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gtggtggaac ggctgggcac gatcggcgtc gcccggcaga acctggagtc gcgccacggc 300

gagacagtgg gcacgctcgt ccgggaggcg atccgggagt ccgaacgcgc gctgcgggcg 360

ctcgacgagg cgacgatcgc gctcaccgag ggccgggcgg gcgcggacga cgcgtacgcg 420

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gccacggagt tcctggacct cgaccccagc gcggacgggc gcccgcgccg ctacgccggg 780

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cccggactgg tccaggcgct gcgccgccgg caggaggcgc tcgacgcgca ccgcgtcacc 1020

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accgccgccc tgctgacgac ccgggcggcg gtggtcgtcg ccacccacga ccggcagatg 1620

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tcggtcactt ccgagcgata tgactgggag tcataa 1716

<210> 4
<211> 689
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 4

Met Thr Thr Gly Arg Pro Gly Glu Asn Arg Ala Thr Asp Ala Ala Arg
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Asn Pro Gly Trp Ala Ala Gly Gly Pro Ala Ser Gln Pro Trp Gly Gly
20 25 30

Gly Asn Asp Glu Gln Val Leu Arg Glu Ile Leu Gly Val Asp Val His
35 40 45

Arg Glu Leu Ile Asp Phe Ala Gly Gly Ala Gly Gly Asn Pro His Leu
50 55 60

Val Ala Glu Leu Ala Arg Gly Leu Ala Glu Glu Gly Leu Ile Arg Glu
65 70 75 80

Thr Asn Gly Arg Ala Glu Leu Val Ser Arg Arg Ile Pro Arg Arg Val
85 90 95

Leu Ser Phe Val Met Arg Arg Leu Asn Asp Val Ser Ala Gly Cys Gln
100 105 110

Gln Phe Leu Lys Val Ala Ala Ala Leu Gly Arg Ser Phe Met Leu Glu
115 120 125

Asp Val Ser Arg Met Leu Gly Arg Ser Ser Ala Ala Leu Leu Pro Pro
130 135 140

Val Asp Glu Ala Ile Ala Ser Gly Phe Val Val Ala Ala Glu His Gln
145 150 155 160

Leu Ala Phe Gln Ser Asp Phe Leu Leu Arg Gly Ile Ile Glu Ser Ile
165 170 175

Pro Gly Pro Ala Arg Asp Ala Leu Arg Arg Glu Ala Met Ser Leu Ser
180 185 190

Gly Arg Arg Arg Pro Ala Ala Asp Gln Asn Arg Arg Leu Asp Ala Ala
195 200 205

Pro Thr Ala Pro Val Ser Ala Thr Gly Glu Asp Ala Thr Gly Ser Cys

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    210                 215                 220

Ser Arg Ala His Arg Leu Ile Met Asn Gly Asn Ala Lys Ala Gly Ile
225                 230                 235                 240

Arg Val Ala Glu Ala Val Leu Ala Gly Pro Ala Ala Ser Leu Ala Ala
                245                 250                 255

Arg Arg Asp Ala Glu Ala Cys Leu Val Leu Ala Asp Leu Leu Leu Gly
            260                 265                 270

Gly Glu Gly Gly Gly Pro Met Thr Glu Ala Ile Leu Arg Glu Arg Asp
        275                 280                 285

Ala Glu Ser Gly Asp Ala Ala Leu Ala Met Ala Leu Thr Ala Arg Ser
    290                 295                 300

Thr Gly Leu Trp Ser Ala Gly Lys Leu Ala Glu Gly Leu Lys Leu Gly
305                 310                 315                 320

Arg Ala Ala Val Arg Ala Gly Ala Glu Ala Glu Pro Val Trp Arg Leu
                325                 330                 335

His Ala Gln Leu Ala Leu Ala Gly Lys Leu Ala Asn Leu Arg Glu Phe
            340                 345                 350

Asp Glu Ala Glu Ala Leu Ile Asn Glu Ala Glu Ala Gly Leu Arg Gly
        355                 360                 365

Leu Pro Ala Pro Ile Trp Thr Ala Ala Thr Ala Val Met Arg Ser Arg
    370                 375                 380

Leu Leu Leu Gln Ala Gly Arg Ile Gly Glu Ala Arg Arg Glu Ala Ala
385                 390                 395                 400

Leu Ala Thr Thr Ala Val Glu Gly Asp Ala Val Pro Met Leu Arg Pro
                405                 410                 415

Leu Ala Tyr Ala Val Leu Ser Thr Ala Ser Phe Tyr Met Gly Asp Leu
            420                 425                 430

Pro Ala Ala Ile Glu Tyr Leu Arg Arg Gly Gln Arg Asp Ala Asp Arg
        435                 440                 445

His Val Val Leu Asp Ser Val Gln Tyr Ser Trp Ala Glu Val Leu Ile
    450                 455                 460

Thr Val Lys Gln Glu Gly Pro Arg Ala Ala Ala Gln Leu Leu Ala Gly
465                 470                 475                 480

Lys His His Arg Leu Pro Thr Gln Arg Arg Leu Tyr Val Glu Val Pro
                485                 490                 495

Ser Ala Ala Ala Phe Leu Val Leu Leu Ala Arg Asp Val Asp Asp Arg
            500                 505                 510

Asp Leu Glu Arg Arg Val Leu Asp Thr Val Asn Gly Leu Ala Ala Asp
```

```
        515                 520                 525

Asn Pro Arg Ile Gln Val Val Ser Leu Thr Ala Met His Ala His Ala
    530                 535                 540

Leu Ala Asn Ser Ala Pro Ala Ala Leu Ala Leu Ile Ile Val Gln Ser
545                 550                 555                 560

Arg Asp Pro Ile Ser Val Ala Leu Ala Thr Glu Glu Leu Ala Lys Leu
                565                 570                 575

Tyr Ala Ala Gln Ala Gln Ala Gly Gly Arg Pro Ala Thr Pro Ala Arg
            580                 585                 590

Ala Glu Glu Ala Ala Thr Pro Pro Ala Ser Cys Trp Ser Thr Leu Ser
        595                 600                 605

Asp Met Glu Gln Arg Ile Ala Tyr Leu Val Ser Val Gly Leu Thr Asn
    610                 615                 620

Arg Gln Ile Ala Lys Gln Val His Leu Ser Ala His Thr Val Asn Tyr
625                 630                 635                 640

His Leu Arg Lys Ile Tyr Arg Lys Leu Gly Phe Asn Thr Arg Ala Glu
                645                 650                 655

Leu Ala His Ala Ala Ala Thr Tyr Ser Gly Arg Ala Ala Ile Tyr Ser
            660                 665                 670

Met Ser Gly Asp Gln Asp Trp Gly Ala Gly Ser Met Thr Gly Lys Ala
        675                 680                 685

Ser
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<210> 5
<211> 2070
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 5
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gccgccgggg ggccggcgtc ccagccatgg ggcgggggga acgacgagca ggtcctgcgc 120

gagatcctcg gggtcgacgt gcaccgcgag ctgattgact tcgcgggtgg tgccggcgga 180

aatccgcacc tggtcgccga actcgcgcgc gggctcgccg aagagggatt gattcgggag 240

acaaacggtc gggcggaatt ggtgtcccgg cgaattcccc ggcgcgtgct gagttttgtc 300

atgcgtcgat tgaatgatgt cagcgccggc tgccagcagt tcttgaaggt tgccgcggca 360

ttgggcagat ccttcatgct ggaggacgtt tcgagaatgc tgggccgatc gtcggcggcc 420

ctgctcccgc cggtggacga ggcgatcgca tcgggcttcg tcgtcgccgc cgagcatcaa 480

ctcgcctttc agagcgactt cctgctgcgc ggcatcatcg agtccattcc cgggcccgcc 540

cgcgacgcct tacgacgtga ggcgatgagc ctttccgggc gacggcgccc ggcggccgac 600

cagaatcgcc ggttggacgc ggcgcctacc gcgccggtga gcgcgaccgg ggaggacgcc 660

accggatcct gttcccgggc gcaccgcctg ataatgaacg ggaacgcgaa ggccggcatt 720

cgcgtcgccg aggcggttct cgccggcccg gccgcgtcgc tcgctgcccg gcgtgacgcg 780

gaggcgtgtc tggtgctggc cgatctgctg ctcggcgggg agggcggcgg cccgatgacc 840

gaggcgatcc tgcgcgaacg cgacgccgag tccggtgacg ccgcactggc gatggcgctg 900

accgcccggt ccaccgggct gtggtcggcg ggaaagctgg cggagggcct gaagctggga 960

cgggcggcgg tgcgggcggg cgcggaggcc gaaccggtgt ggcgtctgca cgcccagctc 1020

gcgctcgccg ggaaactcgc gaacctccgc gagttcgacg aggccgaggc gttgatcaac 1080

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cgggggcagc gggacgcgga ccgccacgtg gtcctcgact cggtgcagta ctcgtgggcg 1380

gaagtgctga tcacggtcaa gcaggaaggc ccgcgggccg ccgcccagct gctcgcgggc 1440

aagcaccacc gcctgcccac gcagcgccgc ctctacgtcg aggtgccgag cgccgccgcc 1500

ttcctggtcc tgctcgcccg cgacgtggac gaccgtgacc tcgaacgccg cgtcctcgac 1560

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cacctgcgga agatctaccg gaaactgggt ttcaacaccc gggccgagct ggcgcacgcc 1980

gcggccacgt actccggccg ggcggcgatc tactccatga gcggcgacca ggactggggc 2040

gccggatcca tgaccggcaa ggccagctga 2070

<210> 6
<211> 895

<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 6

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Leu Gly Glu Leu Leu Asp Ala Thr Met Arg Gly Ser Gly Gly Cys Val
20 25 30

Val Val Asp Gly Pro Phe Gly Ile Gly Lys Thr His Leu Leu Lys Val
35 40 45

Thr Gly Leu Glu Ala Ala Ala Arg Gly Leu Thr Val Val Ala Gly Arg
50 55 60

Ala Ser Val Thr Asp Gln Pro Val Pro Val His Leu Leu Val Asn Phe
65 70 75 80

Leu Arg His Ala Met Pro Gly Glu Ala Ala Val Glu Gln Leu Ala Leu
85 90 95

Pro Gly Ala Asn Pro Phe Trp Leu Ile Asp Arg Val Gly Asp Leu Val
100 105 110

Glu Val Ala Ala Arg Arg Arg Pro Leu Val Val Ala Leu Asp Asp Ala
115 120 125

Gln Arg Ile Asp Asp Val Ser Ala Leu Ala Leu Arg Gly Leu Val Pro
130 135 140

Arg Leu Ala Ser Ser Pro Val Leu Trp Leu Leu Ala Arg Arg Pro Val
145 150 155 160

Ala Ala Gly Ser Ile Ala Gln His Ala Val Asp Trp Leu Ala Glu His
165 170 175

Val Ala Val Arg Val Arg Leu Arg Glu Pro Gly Glu Glu Ala Val Ala
180 185 190

Asp Leu Cys Ala Gly Ile Leu Gly Ala Arg Pro Asp Ala Ser Val Leu
195 200 205

Arg Trp Ala Ala Arg Cys Gly Gly Asn Pro Lys Val Met Glu Ile Val
210 215 220

Phe Ser Ala Phe Ile Lys Ala Gly Gln Met Ile Ile Val Asp Gly Ala
225 230 235 240

Ala Ser Val Val Ser Asp Glu Leu Pro Asp Gly Val Leu Ala Ala Val
245 250 255

Arg Gly Leu Leu Glu Glu Leu Pro Pro Pro Leu Arg Arg Leu Leu Ala
260 265 270

Ala Gly Gly Arg Leu Gly His Thr Phe Pro Val Asp Arg Val Thr Gly

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        275                 280                 285

Leu Leu Asp Gly Ser Ala Ala Asp Val Ser Ala Ala Ile Asp Glu Ala
    290                 295                 300

Val Arg Val Gly Leu Ile Arg Arg Asp Gly Ala Glu Leu Thr Phe Ala
305                 310                 315                 320

His Pro Val Leu Gly Glu Ala Leu Arg His Ala Ala Tyr Pro Glu Pro
                325                 330                 335

Glu Arg Ala Glu Pro Gly Ser Ala Pro Ala Pro Ala Ala Gly Asp Pro
            340                 345                 350

Val Arg Arg Gly Arg Pro Asp Pro Arg Pro Gly Thr Pro His Ser Pro
        355                 360                 365

Ala Gly Val Arg Val Thr Arg Ser Ala Pro Asp Ala Ala Thr Pro Ala
    370                 375                 380

Ala Thr Ala Gly Pro Arg Ser Gly Arg Cys Gly Cys Asp Asp Val Ala
385                 390                 395                 400

Ala Ala Ala Val Ser His Leu Glu Asn Gly Ser Ala Glu Ala Pro Arg
                405                 410                 415

Ala Leu Ala Arg Ala Leu Arg Leu Leu Ala Gly Ala Gly Arg Ala Ala
            420                 425                 430

Glu Ala Gly Arg Leu Ala Glu Val Met Leu Arg Arg Asp Leu Ala Ala
        435                 440                 445

Asp Val Glu Ala Gln Leu Val Leu Glu Leu Gly His Gly Met Arg Ala
    450                 455                 460

Ala Gly Ser His Arg Leu Ala Ala Gly Phe Leu Arg Arg Thr Gln Ala
465                 470                 475                 480

Arg His Asp Val Cys Glu Leu Asp Arg Ala Lys Leu Asp Arg Ala Leu
                485                 490                 495

Ala Asp Thr Thr Lys His Leu Gly Gly Ala Ser Ser Ala Glu Leu Glu
            500                 505                 510

Pro Arg His Gln Ser Pro Gly Cys Ala Pro Gly Arg Arg Pro Leu Trp
        515                 520                 525

Thr Trp Leu Val Arg Ala Leu Gly Ala Ala Asp Gln Leu Asp Glu Ala
    530                 535                 540

Gln Ala Val Leu Asp Thr Val Arg Pro Leu Ala Gln Glu Pro Ser His
545                 550                 555                 560

Thr Gly Ser Glu Ser Leu Trp Arg Gly His Arg Ala Glu Leu Leu Ala
                565                 570                 575

Ala Ala Gly Arg Leu Asp Glu Ala Arg Ala Glu Ala Glu Ala Ala Leu
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            580                 585                 590

Arg Ala Ala Asp His Ser Arg Pro Gly Asp Cys Val Pro Ala Arg Leu
        595                 600                 605

Val Leu Ala His Leu Gly Val His His Gly Asp Leu Ala Thr Ala Ser
    610                 615                 620

Asp Gln Leu Arg Ala Ala Glu Arg Leu Ala Ser Ala Asp Asp Ser Ala
625                 630                 635                 640

Arg Met Asp Trp Ala Leu Ala Arg Phe His Ala Ala Ser Gly Arg Pro
                645                 650                 655

Ala Met Met Val Gln Thr Leu Ile Asn Val Ala Gly Gln Val Ala Pro
            660                 665                 670

Asp Pro Leu Leu Phe Thr Glu Ala Pro Ala Ala Ala Ala Thr Leu Val
        675                 680                 685

Arg Gln Ala Arg Arg Ala Gly Leu Asp Ala Glu Ala Glu Arg Ala Val
    690                 695                 700

Glu Val Ala Arg Arg Val Ala Arg Gly Asn Pro Phe Val Gln Ser Leu
705                 710                 715                 720

Ala Ala Ala Ala Glu His Ala Ala Gly Leu Leu Arg Asp Asp Pro Ala
                725                 730                 735

Ala Leu Leu Arg Ala Ala Asp Leu His Arg Leu Ala Gly Arg Thr Leu
            740                 745                 750

Ala Ala Ala Gly Ala Val Glu Asp Ala Ala Arg Ser Thr Arg Asp Arg
        755                 760                 765

Ala Glu Ala Thr Arg Leu Leu Glu Ala Ala Thr Asp Gly Tyr Arg Glu
    770                 775                 780

Cys Gly Ala Arg Arg Asp Leu Glu Arg Val Glu Ala Glu Leu Arg Gly
785                 790                 795                 800

Leu Pro Ala His Asn Val Arg Pro Leu Val Pro Asp Arg Pro Arg Ser
                805                 810                 815

Gly Trp Glu Ser Leu Thr Ser Ala Glu Leu Arg Val Val Arg Ala Ile
            820                 825                 830

Val Asp Gly Met Thr Asn Arg Glu Ala Ala Ser Ser Leu Phe Leu Ser
        835                 840                 845

Pro His Thr Val Asp Ser His Leu Arg Arg Val Phe Ser Lys Leu Asp
    850                 855                 860

Ile Asn Ser Arg Val Glu Leu Thr Arg Cys Phe Ile Ala His Glu Ala
865                 870                 875                 880

Val Arg Pro Ala Leu Ala Thr Thr Arg Gln Pro Ala Ser Ala Gly
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885 890 895

<210> 7
<211> 2688
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 7
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tccaagctcg acatcaacag ccgggtggaa ctgacccgct gcttcatcgc gcacgaggcg 2640

gtccggccgg cgctggccac cacacgccag ccggcgtccg ccggctga 2688

<210> 8
<211> 362
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 8

Met Thr Val Gly Tyr Leu Gly Thr Val Thr Asp Ser Ala Pro Val Asp
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Ala Ala Leu Arg Asp Phe Phe Ala Glu Arg Arg Ala Glu Ala Arg Glu
20 25 30

Leu Gly Asp Asp Phe Ala Ala Leu Val Ala Glu Leu Glu Ser Tyr Val
35 40 45

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Leu Arg Gly Gly Lys Arg Ile Arg Pro Ala Phe Ala Trp Leu Gly Trp
    50                  55                  60

Ile Gly Ala Gly Gly Asp Pro Glu Asp Pro Val Ala Thr Ala Val Leu
65                  70                  75                  80

Asn Ala Cys Ala Gly Phe Glu Leu Leu His Ala Ser Gly Leu Ile His
                85                  90                  95

Asp Asp Ile Ile Asp Ala Ser Gln Thr Arg Arg Gly His Pro Ala Ala
            100                 105                 110

His Val Ala Tyr Ala Glu Arg His Arg Ala Arg Arg Phe Ser Gly Asp
        115                 120                 125

Pro Gly Thr Phe Gly Thr Gly Thr Ala Ile Leu Ile Gly Asp Leu Val
    130                 135                 140

Leu Ile Trp Ala Asp Val Leu Val Arg Ala Ser Gly Leu Pro Ala Asp
145                 150                 155                 160

Ala His Val Arg Val Ser Pro Val Trp Ser Ala Val Arg Ser Glu Val
                165                 170                 175

Met Tyr Gly Gln Leu Leu Asp Leu Ile Ser Gln Val Ser Arg Ser Glu
            180                 185                 190

Asp Val Asp Ala Ala Leu Arg Ile Asn Gln Tyr Lys Thr Ala Ser Tyr
        195                 200                 205

Thr Val Glu Arg Pro Leu Gln Phe Gly Ala Ala Ile Ala Gly Ala Asp
    210                 215                 220

Asp Asp Leu Phe Ala Ala Tyr Arg Ala Phe Gly Ala Asp Val Gly Ile
225                 230                 235                 240

Ala Phe Gln Leu Arg Asp Asp Leu Leu Gly Val Phe Gly Asp Pro Val
                245                 250                 255

Val Thr Gly Lys Pro Ser Gly Asp Asp Leu Arg Glu Gly Lys Arg Thr
            260                 265                 270

Val Leu Leu Ala Thr Ala Leu Lys Arg Ala Asp Glu Arg Asp Pro Asp
        275                 280                 285

Ala Ala Ala Tyr Leu Arg Ala Lys Val Gly Thr Asp Leu Ala Asp Glu
    290                 295                 300

Glu Ile Ala Arg Ile Arg Ala Ile Phe Arg Asp Val Gly Ala Val Glu
305                 310                 315                 320

Glu Ile Glu Arg Gln Ile Ser Gln Arg Thr Asp Arg Ala Leu Ala Ala
                325                 330                 335

Leu Glu Ala Ser Ser Ala Thr Ala Pro Ala Lys His Gln Leu Ala Asp
            340                 345                 350
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Met Ala Ile Lys Ala Thr Gln Arg Ala Gln
355 360

<210> 9
<211> 1089
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 9
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gacttcttcg ccgagcgccg cgccgaggca cgcgagctcg gcgacgactt cgcggccctg 120

gtcgccgagc tggagagcta cgtcctgcgg ggcggcaagc gcatccggcc cgccttcgcc 180

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aacgcctgcg ccgggttcga gctgctgcac gcgtccggcc tcatccacga cgacatcatc 300

gacgcgtcgc agacccgccg cggccatccc gccgcgcacg tcgcgtacgc cgaacggcat 360

cgggcgcggc gcttctccgg tgacccggga acgttcggca ccggcaccgc catcctgatc 420

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gcgcacgtgc gggtctcgcc ggtgtggtcg gcggtgcgct ccgaggtcat gtacggccag 540

ctgctcgatc tgatcagcca ggtgagccgg agcgaggacg tcgacgcggc gctgcgcatc 600

aaccagtaca agaccgcgtc gtacacggtg gagcggccac tgcagttcgg cgcggcgatc 660

gccggcgcgg acgacgacct cttcgcggcc taccgcgcct tcggcgccga cgtgggtatt 720

gccttccagc tgcgcgacga cctgctcggc gtgttcggcg acccggtggt gacgggcaag 780

ccgtccggcg acgacctgcg ggagggcaag cggacggtcc tgctcgccac ggcgctcaag 840

cgcgccgacg aacgggaccc ggacgcggcg gcctacctgc gggcgaaggt cggcacggac 900

ctcgcggacg aggagatcgc ccgcatccgc gccatcttcc gcgacgtcgg cgcggtcgag 960

gagatcgagc ggcagatctc gcagcgcacc gaccgggcgc tggccgcgct ggaggcgagc 1020

agcgccaccg cccccgcgaa gcatcagctc gccgacatgg cgatcaaggc cacccagcgg 1080

gcccagtga 1089

<210> 10
<211> 354
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 10

Met Ser Thr Glu Pro Val Thr Val Val Ala Arg Gly Val Leu Asp Gly

```
1               5                   10                  15

Arg Gly Asp Gly Pro Gly Arg Leu Gly Thr Gly Arg Ala His Gly Lys
            20                  25                  30

Ala Ile Leu Leu Gly Glu His Ala Val Val Tyr Gly Ala Pro Ala Leu
        35                  40                  45

Ala Val Pro Val Pro Gln Leu Thr Ala Val Ala Lys Ala Arg Arg Ala
    50                  55                  60

Gly Gly Asp Gly Gly Asp Glu Val Ser Phe Ala Ile Ala Gly Leu Glu
65                  70                  75                  80

Ser Pro Glu Val Thr Ser Leu Pro Thr Asp Gly Leu Gln His Leu Val
                85                  90                  95

Thr Glu Phe Arg Gln Arg Ala Ala Val Thr Glu Pro Met Arg Val Asp
            100                 105                 110

Val Leu Val Asp Cys Ala Ile Pro Gln Gly Arg Gly Leu Gly Ser Ser
        115                 120                 125

Ala Ala Cys Ala Arg Ala Ala Val Leu Ala Leu Ala Asp Ala Phe Asp
    130                 135                 140

Arg Arg Leu Asp Ala Ala Thr Val Phe Asp Leu Val Gln Thr Ser Glu
145                 150                 155                 160

Asn Val Ala His Gly Arg Ala Ser Gly Ile Asp Ala Leu Ala Thr Gly
                165                 170                 175

Ala Thr Ala Pro Leu Ile Phe Arg Asn Gly Val Gly Arg Glu Leu Pro
            180                 185                 190

Val Ala Met Ala Gly Ala Ala Arg Ala Ala Arg Gly Ser Gly Pro Ala
        195                 200                 205

Gly Phe Asp Ala Val Leu Val Ile Ala Asp Ser Gly Val Ser Gly Ser
    210                 215                 220

Thr Arg Asp Ala Val Glu Leu Leu Arg Gly Ala Phe Glu Arg Ser Pro
225                 230                 235                 240

Arg Thr Arg Asp Glu Phe Val Ser Arg Val Thr Ser Leu Thr Glu Ala
                245                 250                 255

Ala Ala His Asp Leu Leu Gln Gly Arg Val Ala Asp Phe Gly Ala Arg
            260                 265                 270

Leu Thr Glu Asn His Arg Leu Leu Arg Glu Val Gly Ile Ser Thr Glu
        275                 280                 285

Arg Ile Asp Arg Met Val Asp Ala Ala Leu Ala Ala Gly Ser Pro Gly
    290                 295                 300

Ala Lys Ile Ser Gly Gly Gly Leu Gly Gly Cys Met Ile Ala Leu Ala
```

305 310 315 320

Arg Asp Arg Gln Glu Ser Ala Ala Val Val Arg Ser Val Gln Gln Ala
325 330 335

Gly Ala Val Arg Thr Trp Thr Val Pro Met Gly Arg Phe Thr Gly His
340 345 350

Asp Asp

<210> 11
<211> 1065
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 11
atgtccacgg aaccggtgac cgtcgtcgcc cgcggcgttc tcgacggccg gggtgacggg 60

ccgggccgcc tcggcaccgg ccgcgcccac ggcaaggcca tcctgctggg cgaacacgcc 120

gtcgtgtacg gcgctccggc gctcgccgtc ccggtgccgc aactgaccgc cgtggccaag 180

gcgcggcggg ccggcggcga cggcggcgac gaggtctcct tcgccatcgc cgggctggag 240

agcccggagg tgacgtcgct tccgaccgac ggcctgcaac atctggtgac ggagttccgg 300

cagcgggccg ccgtcaccga gccgatgcgc gtcgacgtgc tcgtggactg cgccatcccg 360

cagggccggg ggctcgggtc gagcgccgcc tgcgcccgcg ccgcggtgct ggccctcgcg 420

gacgcgttcg accgccgcct cgacgccgcc acggtgttcg atctggtgca gacctcggag 480

aacgtggcgc acggccgggc cagcggcatc gacgccctgg ccaccggtgc gaccgcgccg 540

ctgatcttcc gcaacggcgt gggccgggaa ctgccggtcg ccatggcggg cgccgcgcgt 600

gccgcgcgag ggtcgggccc ggccggcttc gacgcggtgc tcgtcatcgc cgacagcggc 660

gtcagcggca gcacccggga cgcggtggag ctgctgcggg gtgccttcga gcgctccccg 720

cgcacgcgcg acgagttcgt cagccgggtg accagcctga ccgaggcggc ggcgcacgac 780

ctgctccagg gccgggtcgc cgacttcggc gcgcggctga ccgagaacca ccggctgttg 840

cgcgaggtcg gcatcagcac cgaacggatc gaccggatgg tcgacgccgc gctcgcggcg 900

ggcagcccgg gcgccaagat cagcggcggt ggcctgggcg gctgcatgat cgcactggcc 960

cgggaccgcc aggaatccgc ggcggtggtg cggagcgtcc agcaggccgg cgccgtccgc 1020

acctggaccg tcccgatggg gaggttcacc ggccatgacg actga 1065

<210> 12
<211> 346
<212> PRT

<213> Micromonospora sp. strain 046-ECO11

<400> 12

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Met Thr Thr Asp His Arg Ala Glu Pro Ser Glu Pro Ala Leu Asp Arg
1               5                  10                  15

Pro Ala Thr Ala Val Ala His Pro Asn Ile Ala Leu Ile Lys Tyr Trp
            20                  25                  30

Gly Lys Arg Asp Glu Gln Leu Met Ile Pro Tyr Ala Asp Ser Leu Ser
        35                  40                  45

Met Thr Leu Asp Val Phe Pro Thr Thr Thr Thr Val Arg Ile Asp Ser
    50                  55                  60

Gly Ala Ala Ala Asp Glu Val Val Leu Asp Gly Ser Pro Ala Asp Gly
65                  70                  75                  80

Glu Arg Arg Gln Arg Val Val Thr Phe Leu Asp Leu Val Arg Lys Leu
                85                  90                  95

Ala Gly Arg Thr Glu Arg Ala Cys Val Asp Thr Arg Asn Ser Val Pro
            100                 105                 110

Thr Gly Ala Gly Leu Ala Ser Ser Ala Ser Gly Phe Ala Ala Leu Ala
        115                 120                 125

Leu Ala Gly Ala Ala Ala Tyr Gly Leu Asp Leu Asp Thr Thr Ala Leu
    130                 135                 140

Ser Arg Leu Ala Arg Arg Gly Ser Val Ser Ala Ser Arg Ser Val Phe
145                 150                 155                 160

Gly Gly Phe Ala Met Cys His Ala Gly Pro Gly Ala Gly Thr Ala Ala
                165                 170                 175

Asp Leu Gly Ser Tyr Ala Glu Pro Val Pro Val Ala Pro Leu Asp Val
            180                 185                 190

Ala Leu Val Ile Ala Ile Val Asp Ala Gly Pro Lys Ala Val Ser Ser
        195                 200                 205

Arg Glu Gly Met Arg Arg Thr Val Arg Thr Ser Pro Leu Tyr Gln Ser
    210                 215                 220

Trp Val Ala Ser Gly Arg Ala Asp Leu Ala Glu Met Arg Ala Ala Leu
225                 230                 235                 240

Leu Gln Gly Asp Leu Asp Ala Val Gly Glu Ile Ala Glu Arg Asn Ala
                245                 250                 255

Leu Gly Met His Ala Thr Met Leu Ala Ala Arg Pro Ala Val Arg Tyr
            260                 265                 270

Leu Ala Pro Val Thr Val Ala Val Leu Asp Ser Val Leu Arg Leu Arg
        275                 280                 285
```

```
Ala Asp Gly Val Ser Ala Tyr Ala Thr Met Asp Ala Gly Pro Asn Val
    290                 295                 300

Lys Val Leu Cys Arg Arg Ala Asp Ala Asp Arg Val Ala Asp Thr Leu
305                 310                 315                 320

Arg Asp Ala Ala Pro Ser Cys Ala Val Val Val Ala Gly Pro Gly Pro
                325                 330                 335

Ala Ala Arg Pro Asp Pro Gly Ser Arg Pro
            340                 345
```

<210> 13
<211> 1041
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 13

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atgacgactg accaccgggc ggagccgtcc gagccggcgc tcgaccggcc cgcgaccgcc     60

gtggcccatc cgaacatcgc gctgatcaag tactggggca agcgcgacga gcagctgatg    120

atcccgtacg ccgacagcct gtcgatgacg ctcgacgtct tcccgaccac caccaccgtc    180

cggatcgaca gcggcgcggc ggccgacgag gtcgtcctcg acggctcgcc cgccgacggc    240

gaacggcgac agcgcgtcgt caccttcctg gacctggtac gcaagctggc cgggcgcacg    300

gaacgggcct gcgtcgacac ccgcaactcc gtgcccaccg gcgccggcct ggcgtcctcg    360

gcgagcggat tcgccgccct cgccctcgcc ggcgccgccg cgtacggcct cgacctggac    420

accaccgcgc tgtcccgcct ggcccggcgg ggatccgtgt cggcctcccg gtcggtcttc    480

ggcggcttcg cgatgtgcca cgcaggcccc ggcgccggga ccgccgcgga cctcggctcc    540

tacgccgagc cggtgcccgt cgcgcccctc gacgtcgcgc tggtgatcgc gatcgtcgac    600

gccgggccga aggcggtgtc gagccgcgag gggatgcggc gaaccgtccg gacctccccg    660

ctctatcagt cgtgggtcgc ctccggccgc gccgacctgg ccgagatgcg ggccgcgctg    720

ctccagggag acctggacgc ggtcggcgag atcgccgaac gcaacgccct cggcatgcac    780

gccaccatgc tggccgcccg gccggcggtg cgctacctgg cgccggtcac tgtcgccgtg    840

ctcgacagcg tgctgcgcct gcgcgccgac ggcgtctccg cctacgccac gatggacgcg    900

ggaccgaacg tcaaggtgct ctgccgccgc gcggacgccg accgggtcgc cgacaccctg    960

cgcgacgccg cgccgagctg cgccgtggtc gtcgccggac cggggccggc ggcccggccg   1020

gacccgggca gccggccgtg a                                             1041
```

<210> 14

<211> 369
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 14

Val Thr Gly Pro Gly Ala Val Arg Arg His Ala Pro Gly Lys Leu Phe
1 5 10 15

Val Ala Gly Glu Tyr Ala Val Leu Glu Pro Gly His Pro Ala Leu Leu
20 25 30

Val Ala Val Asp Arg Gly Val Asp Val Thr Val Ser Gly Ala Asp Ala
35 40 45

His Leu Val Val Asp Ser Asp Leu Cys Pro Glu Gln Ala Cys Leu Arg
50 55 60

Trp Gln Asp Gly Arg Leu Val Gly Ala Gly Asp Gly Gln Pro Ala Pro
65 70 75 80

Asp Ala Leu Gly Ala Val Val Ser Ala Ile Glu Val Val Gly Glu Leu
85 90 95

Leu Thr Gly Arg Gly Leu Arg Pro Leu Pro Met Arg Val Ala Ile Thr
100 105 110

Ser Arg Leu His Arg Asp Gly Thr Lys Phe Gly Leu Gly Ser Ser Gly
115 120 125

Ala Val Thr Val Ala Thr Val Thr Ala Val Ala Ala Tyr His Gly Val
130 135 140

Glu Leu Ser Leu Glu Ser Arg Phe Arg Leu Ala Met Leu Ala Thr Val
145 150 155 160

Arg Asp Gly Ala Asp Ala Ser Gly Gly Asp Leu Ala Ala Ser Val Trp
165 170 175

Gly Gly Trp Ile Ala Tyr Gln Ala Pro Asp Arg Ala Ala Val Arg Glu
180 185 190

Met Ala Arg Arg Arg Gly Val Glu Glu Thr Met Arg Ala Pro Trp Pro
195 200 205

Gly Leu Arg Val Arg Arg Leu Pro Pro Pro Arg Gly Leu Ala Leu Glu
210 215 220

Val Gly Trp Thr Gly Glu Pro Ala Ser Ser Ser Ser Leu Thr Gly Arg
225 230 235 240

Leu Ala Ala Ser Arg Trp Arg Gly Ser Pro Ala Arg Trp Ser Phe Thr
245 250 255

Ser Arg Ser Gln Glu Cys Val Arg Thr Ala Ile Asp Ala Leu Glu Arg
260 265 270

```
Gly Asp Asp Gln Glu Leu Leu His Gln Val Arg Arg Ala Arg His Val
        275                 280                 285

Leu Ala Glu Leu Asp Asp Glu Val Arg Leu Gly Ile Phe Thr Pro Arg
    290                 295                 300

Leu Thr Ala Leu Cys Asp Ala Ala Glu Thr Val Gly Gly Ala Ala Lys
305                 310                 315                 320

Pro Ser Gly Ala Gly Gly Gly Asp Cys Gly Ile Ala Leu Leu Asp Ala
                325                 330                 335

Thr Ala Ala Thr Arg Thr Ala Arg Leu Arg Glu Gln Trp Ala Ala Ala
            340                 345                 350

Gly Val Leu Pro Met Pro Ile Gln Val His Gln Thr Asn Gly Ser Ala
        355                 360                 365

Arg
```

<210> 15
<211> 1110
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 15

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gtgaccggcc cgggcgccgt gcgccgccac gcgccgggca agctgttcgt cgccggtgag     60

tacgcggtgc tggagccggg ccacccggcg ctgctggtgg cggtcgacag gggagtggac    120

gtcaccgtct ccggcgccga cgcccacctc gttgtcgact ccgacctctg cccggagcag    180

gcgtgcctgc ggtggcagga cggccggctc gtcggcgcgg gcgacgggca gccggcgccc    240

gacgccctcg gcgccgtggt ctcggcgatc gaggtggtcg gcgaactcct gaccggacga    300

gggctgcgcc cgctgcccat gcgggtggcg atcaccagcc ggctgcaccg cgacggcacg    360

aagttcggcc tcgggtcgag cggggcggtg acagtcgcca cggtgaccgc agtggccgcg    420

taccacgggg tggagctgtc gctcgaatcg cggttccggc tggcgatgct ggcgacggtg    480

cgtgacggcg ccgacgcctc cggcggtgat ctggccgcga gcgtctgggg cggctggatc    540

gcctaccagg cgcccgaccg cgcggccgtg cgcgagatgg cgcggcggcg cggcgtcgag    600

gagacgatgc gcgcgccctg gccgggcctg cgggtccggc ggctgccacc accgcgtggc    660

ctcgcgctgg aggtgggctg gaccggcgag ccggcgagca gcagctcgtt gaccgggcgg    720

ctggccgcct cccggtggcg gggcagcccg gcgcggtgga gcttcaccag ccgtagccag    780

gagtgtgtgc gtaccgccat cgacgcgctg gagcggggcg acgaccagga actgctgcac    840

caggtccggc gggcccggca cgtgcttgcc gagctggacg acgaggtccg gctcgggatc    900
```

ttcacccccc ggctgacggc gctgtgcgac gccgccgaga ccgtcggcgg cgcggccaaa 960

ccgtccggcg ccggtggcgg ggactgcggc atcgcgttgc tggacgccac cgccgcgacg 1020

cggaccgcgc ggctgcgcga gcagtgggcc gccgccgggg tgctccccat gccgatccag 1080

gtccatcaga cgaacgggag cgcgcgatga 1110

<210> 16
<211> 360
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 16

Met Ile Ala Asn Arg Lys Asp Asp His Val Arg Leu Ala Ala Glu Gln
1 5 10 15

Gln Gly Arg Leu Gly Gly His His Glu Phe Asp Asp Val Ser Phe Val
20 25 30

His His Ala Leu Ala Gly Ile Asp Arg Ser Asp Val Ser Leu Ala Thr
35 40 45

Ser Phe Gly Gly Ile Asp Trp Pro Val Pro Leu Cys Ile Asn Ala Met
50 55 60

Thr Gly Gly Ser Thr Lys Thr Gly Leu Ile Asn Arg Asp Leu Ala Ile
65 70 75 80

Ala Ala Arg Glu Thr Gly Val Pro Ile Ala Thr Gly Ser Met Ser Ala
85 90 95

Tyr Phe Ala Asp Glu Ser Val Ala Glu Ser Phe Ser Val Met Arg Arg
100 105 110

Glu Asn Pro Asp Gly Phe Ile Met Ala Asn Val Asn Ala Thr Ala Ser
115 120 125

Val Glu Arg Ala Arg Arg Ala Val Asp Leu Met Arg Ala Asp Ala Leu
130 135 140

Gln Ile His Leu Asn Thr Ile Gln Glu Thr Val Met Pro Glu Gly Asp
145 150 155 160

Arg Ser Phe Ala Ala Trp Gly Pro Arg Ile Glu Gln Ile Val Ala Gly
165 170 175

Val Gly Val Pro Val Ile Val Lys Glu Val Gly Phe Gly Leu Ser Arg
180 185 190

Glu Thr Leu Leu Arg Leu Arg Asp Met Gly Val Arg Val Ala Asp Val
195 200 205

Ala Gly Arg Gly Gly Thr Asn Phe Ala Arg Ile Glu Asn Asp Arg Arg
210 215 220

```
Asp Ala Ala Asp Tyr Ser Phe Leu Asp Gly Trp Gly Gln Ser Thr Pro
225                 230                 235                 240

Ala Cys Leu Leu Asp Ala Gln Gly Val Asp Leu Pro Val Leu Ala Ser
                245                 250                 255

Gly Gly Ile Arg Asn Pro Leu Asp Val Val Arg Gly Leu Ala Leu Gly
            260                 265                 270

Ala Gly Ala Ala Gly Val Ser Gly Leu Phe Leu Arg Thr Leu Leu Asp
        275                 280                 285

Gly Gly Val Pro Ala Leu Leu Ser Leu Leu Ser Thr Trp Leu Asp Gln
    290                 295                 300

Ile Glu Ala Leu Met Thr Ala Leu Gly Ala Arg Thr Pro Ala Asp Leu
305                 310                 315                 320

Thr Arg Cys Asp Leu Leu Ile Gln Gly Arg Leu Ser Ala Phe Cys Ala
                325                 330                 335

Ala Arg Gly Ile Asp Thr His Arg Leu Ala Thr Arg Ser Gly Ala Thr
            340                 345                 350

His Glu Met Ile Gly Gly Ile Arg
        355                 360
```

<210> 17
<211> 1083
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 17

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atgatcgcca accgcaagga cgaccacgtc cggctcgccg ccgagcagca gggccggctc     60

ggcggtcacc acgagttcga cgacgtgtcc ttcgtgcacc acgccctggc cggcatcgac    120

cggtccgacg tctcgctggc cacgtcgttc ggcggcatcg actggccggt gccgctgtgc    180

atcaacgcga tgaccggcgg cagcaccaag accggcctga tcaaccggga cctggcgatc    240

gcggcccggg agaccggcgt accgatcgcc accgggtcga tgagcgccta cttcgccgac    300

gagtcggtgg ccgagagttt cagcgtgatg cgccgggaga accccgacgg gttcatcatg    360

gccaacgtca acgccaccgc ctccgtcgaa cgggcccggc gggctgtcga cctgatgcgg    420

gccgacgcgc tgcagatcca cctgaacacc atccaggaga cggtgatgcc ggaggggggac    480

cggtcgttcg ccgcctgggg gccgcggatc gaacagatcg tcgccggcgt cggtgtgccg    540

gtgatcgtca aggaggtcgg cttcgggctc agccgcgaaa cgctgctgcg gctgcgggac    600

atgggcgtcc gggtggccga cgtcgccggc cgcggcggca cgaacttcgc gcgcatcgag    660

aacgaccggc gggacgccgc cgactactcc ttcctcgacg ggtggggaca gtcgacaccc    720
```

gcctgcctgc tggacgccca gggcgtggac ctgcccgtgc tggcctccgg cggcatccgc 780

aacccgctcg acgtggtccg cgggctggcg ctcggcgccg gcgcggccgg ggtgtccgga 840

ctgttcctgc gcacgctcct ggacggcggc gtgccggcgc tgctgtcgct gctgtccacc 900

tggctcgacc agatcgaagc cctgatgacc gccctgggcg cgcggacccc ggccgacctg 960

acccgctgcg acctgctgat ccagggtcgg ctgagcgcgt tctgcgcggc ccggggcatc 1020

gacacccacc gcctcgccac ccgttccggc gccacccacg agatgatcgg aggcattcga 1080

tga 1083

<210> 18
<211> 351
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 18

Met Asn Asp Ala Ile Ala Gly Val Pro Met Lys Trp Val Gly Pro Val
1 5 10 15

Arg Ile Ser Gly Asn Val Ala Gln Ile Glu Thr Glu Val Pro Leu Ala
20 25 30

Thr Tyr Glu Ser Pro Leu Trp Pro Ser Val Gly Arg Gly Ala Lys Ile
35 40 45

Ser Arg Met Val Glu Ala Gly Ile Val Ala Thr Leu Val Asp Glu Arg
50 55 60

Met Thr Arg Ser Val Phe Val Arg Ala Lys Asp Ala Gln Thr Ala Tyr
65 70 75 80

Leu Ala Ser Leu Glu Val Asp Ala Arg Phe Asp Glu Leu Arg Asp Ile
85 90 95

Val Arg Thr Cys Gly Arg Phe Val Glu Leu Ile Gly Phe His His Glu
100 105 110

Ile Thr Ala Asn Leu Leu Phe Leu Arg Phe Ser Phe Thr Thr Gly Asp
115 120 125

Ala Ser Gly His Asn Met Ala Thr Leu Ala Ala Asp Ala Leu Leu Lys
130 135 140

His Ile Leu Asp Thr Ile Pro Gly Ile Ser Tyr Gly Ser Ile Ser Gly
145 150 155 160

Asn Tyr Cys Thr Asp Lys Lys Ala Thr Ala Ile Asn Gly Ile Leu Gly
165 170 175

Arg Gly Lys Asn Val Val Thr Glu Leu Val Val Pro Arg Glu Ile Val

```
            180                 185                 190

His Asp Ser Leu His Thr Thr Ala Ala Ala Ile Ala Gln Leu Asn Val
        195                 200                 205

His Lys Asn Met Ile Gly Thr Leu Leu Ala Gly Gly Ile Arg Ser Ala
    210                 215                 220

Asn Ala His Tyr Ala Asn Met Leu Leu Gly Phe Tyr Leu Ala Thr Gly
225                 230                 235                 240

Gln Asp Ala Ala Asn Ile Val Glu Gly Ser Gln Gly Val Thr Val Ala
                245                 250                 255

Glu Asp Arg Asp Gly Asp Leu Tyr Phe Ser Cys Thr Leu Pro Asn Leu
            260                 265                 270

Ile Val Gly Thr Val Gly Asn Gly Lys Gly Leu Gly Phe Val Glu Glu
        275                 280                 285

Asn Leu Glu Arg Leu Gly Cys Arg Ala Ser Arg Asp Pro Gly Glu Asn
    290                 295                 300

Ala Arg Arg Leu Ala Val Ile Ala Ala Ala Thr Val Leu Cys Gly Glu
305                 310                 315                 320

Leu Ser Leu Leu Ala Ala Gln Thr Asn Pro Gly Glu Leu Met Arg Ala
                325                 330                 335

His Val Arg Leu Glu Arg Pro Thr Glu Thr Thr Lys Ile Gly Ala
            340                 345                 350
```

<210> 19
<211> 1056
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 19

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atgaacgacg cgatcgccgg tgtgcccatg aaatgggtag gtcccgtgcg gatctcggga     60

aacgtggcgc agatcgagac ggaggttccg ctcgccacgt acgagtcgcc gctctggccg    120

tccgtcggcc ggggcgcgaa gatctcccgg atggtcgagg cgggcatcgt cgccacgctc    180

gtcgacgagc gcatgacccg ctcggtgttc gtgcgcgcca aggacgcgca gaccgcctac    240

ctggcctcgc ttgaggtcga cgcgcggttc gacgaactgc gtgacatcgt gcgcacctgc    300

ggcaggttcg tcgagctgat cgggttccac cacgagatca ccgcgaacct gctgttcctg    360

cggttcagtt tcaccaccgg cgacgcgtcc gggcacaaca tggcgacgct ggccgccgac    420

gcgctgctga agcacatcct ggacaccatt ccgggcatct cgtacggctc gatctcgggc    480

aactactgca ccgacaagaa ggccaccgcg ataaacggca ttctcggccg gggcaagaac    540

gtggtcaccg agctggtcgt gccgcgggag atcgtccacg acagcctgca cacgacggcg    600
```

gcggcgatcg cccagctgaa cgtgcacaag aacatgatcg gcacgttgct cgccggcggt 660

atccgctcgg ccaacgccca ctacgcgaac atgctgctcg ggttctacct ggccacgggt 720

caggacgccg cgaacatcgt cgagggctcc cagggcgtga cggtcgccga ggaccgcgac 780

ggcgacctct acttctcctg cacgctgccc aacctgatcg tgggcaccgt cggcaacggc 840

aaggggctcg gcttcgtcga ggagaacctg gagcggctcg gctgccgcgc ctcgcgtgat 900

ccgggcgaga acgcccggcg gctcgcggtc atcgcggccg cgacggtgct ctgcggcgag 960

ctgtccctgc tcgccgcgca gaccaacccg ggcgagctga tgcgggcgca cgtccggctc 1020

gaacgcccga ccgagaccac gaagatcgga gcctga 1056

<210> 20
<211> 391
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 20

Met Ala Glu Arg Pro Ala Val Gly Ile His Asp Leu Ser Ala Ala Thr
1 5 10 15

Ala His His Val Leu Thr His Glu Thr Leu Ala Ala Ser Asn Gly Ala
20 25 30

Asp Val Ala Lys Tyr His Arg Gly Ile Gly Leu Arg Ala Met Ser Val
35 40 45

Pro Ala Pro Asp Glu Asp Ile Val Thr Met Ala Ala Ala Ala Ala Ala
50 55 60

Pro Val Val Ala Arg His Gly Thr Asp Arg Ile Arg Thr Val Val Phe
65 70 75 80

Ala Thr Glu Ser Ser Val Asp Gln Ala Lys Ala Ala Gly Ile His Val
85 90 95

His Ser Leu Leu Gly Leu Pro Ser Ala Thr Arg Val Val Glu Leu Lys
100 105 110

Gln Ala Cys Tyr Gly Gly Thr Ala Gly Leu Gln Phe Ala Ile Gly Leu
115 120 125

Val His Arg Asp Pro Ser Gln Gln Val Leu Val Ile Ala Ser Asp Val
130 135 140

Ser Lys Tyr Ala Leu Gly Glu Pro Gly Glu Ala Thr Gln Gly Ala Ala
145 150 155 160

Ala Val Ala Met Leu Val Gly Ala Asp Pro Ala Leu Val Arg Val Glu
165 170 175

```
Asp Pro Ser Gly Met Phe Thr Ala Asp Val Met Asp Phe Trp Arg Pro
            180                 185                 190

Asn Tyr Arg Thr Thr Ala Leu Val Asp Gly His Glu Ser Ile Ser Ala
        195                 200                 205

Tyr Leu Gln Ala Leu Glu Gly Ser Trp Lys Asp Tyr Thr Glu Arg Gly
    210                 215                 220

Gly Arg Thr Leu Asp Glu Phe Gly Ala Phe Cys Tyr His Gln Pro Phe
225                 230                 235                 240

Pro Arg Met Ala Asp Lys Ala His Arg His Leu Leu Asn Tyr Cys Gly
                245                 250                 255

Arg Asp Val Asp Asp Ala Leu Val Ala Gly Ala Ile Gly His Thr Thr
            260                 265                 270

Ala Tyr Asn Ala Glu Ile Gly Asn Ser Tyr Thr Ala Ser Met Tyr Leu
        275                 280                 285

Gly Leu Ala Ala Leu Leu Asp Thr Ala Asp Asp Leu Thr Gly Arg Thr
    290                 295                 300

Val Gly Phe Leu Ser Tyr Gly Ser Gly Ser Val Ala Glu Phe Phe Ala
305                 310                 315                 320

Gly Thr Val Val Pro Gly Tyr Arg Ala His Thr Arg Pro Asp Gln His
                325                 330                 335

Arg Ala Ala Ile Asp Arg Arg Gln Glu Ile Asp Tyr Ala Thr Tyr Arg
            340                 345                 350

Glu Leu His Glu His Ala Phe Pro Val Asp Gly Gly Asp Tyr Pro Ala
        355                 360                 365

Pro Glu Val Thr Thr Gly Pro Tyr Arg Leu Ala Gly Leu Ser Gly His
    370                 375                 380

Lys Arg Val Tyr Glu Pro Arg
385                 390
```

<210> 21
<211> 1176
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 21

```
atggccgaga gacccgccgt cggcatccac gacctgtccg ccgcgacggc gcatcacgtg     60

ctgacacacg agaccctggc cgcgagcaac ggcgccgacg tggccaagta ccaccgtggc    120

atcgggctgc gggcgatgag cgtgcccgcc ccggacgagg acatcgtgac gatggctgct    180

gccgccgccg cgccggtggt cgcccgccac ggcaccgacc ggatccggac cgtcgtgttc    240
```

gccacggagt cgtcggtcga ccaggcgaag gcggccggga tacacgtcca ctccctgctc 300

ggcctcccct cggccacccg ggtggtcgag ctgaagcagg cctgctacgg cggtacggcg 360

ggactgcagt tcgccatcgg cctggtgcac cgtgacccgt cgcagcaggt cctggtgatc 420

gccagcgacg tgtcgaagta cgcgctgggt gagcccggcg aggcgaccca gggcgccgcg 480

gcggtcgcca tgctcgtcgg cgcggacccg gcgctggtac gcgtcgagga cccgtcgggc 540

atgttcaccg ccgacgtcat ggacttctgg cggccgaact accgcaccac cgccctggtc 600

gacgggcacg agtccatctc cgcctacctg caggcgctgg agggctcgtg gaaggactac 660

accgagcgcg gcggtcgcac cctggacgag ttcggcgcgt tctgctacca ccagccgttc 720

ccgaggatgg ccgacaaggc gcaccggcac ctgctcaact actgcgggcg cgacgtcgac 780

gacgcgctgg tggccggggc catcgggcac accaccgcgt acaacgccga gatcggcaac 840

agctacacgg cgtcgatgta tctcgggctc gcggcactgc tcgacaccgc cgacgacctg 900

accggccgga ccgtcggctt cctcagctac gggtccggca gcgtcgccga gttcttcgcc 960

ggcactgtcg tgcccgggta ccgcgcgcac acgcgacccg accagcaccg cgcggcgatc 1020

gaccggcggc aggagatcga ctacgcgacg taccgggagt tgcacgagca cgccttcccg 1080

gtcgacggcg gcgactatcc ggcgccggag gtgaccaccg ggccgtaccg gctggccggg 1140

ctctccggtc acaagcgcgt ctacgagccg cgatag 1176

<210> 22
<211> 290
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 22

Val Ala Glu Leu Tyr Ser Thr Ile Glu Glu Ser Ala Arg Gln Leu Asp
1 5 10 15

Val Pro Cys Ser Arg Asp Arg Val Trp Pro Ile Leu Ser Ala Tyr Gly
20 25 30

Asp Ala Phe Ala His Pro Glu Ala Val Val Ala Phe Arg Val Ala Thr
35 40 45

Ala Leu Arg His Ala Gly Glu Leu Asp Cys Arg Phe Arg Thr His Pro
50 55 60

Asp Asp Arg Asp Pro Tyr Ala Ser Ala Leu Ala Arg Gly Leu Thr Pro
65 70 75 80

Arg Thr Asp His Pro Val Gly Ala Leu Leu Ser Glu Val His Arg Arg
85 90 95

```
Cys Pro Val Glu Ser His Gly Ile Asp Phe Gly Val Val Gly Gly Phe
            100                 105                 110

Lys Lys Ile Tyr Ala Ala Phe Ala Pro Asp Glu Leu Gln Val Ala Thr
        115                 120                 125

Ser Leu Ala Gly Ile Pro Ala Met Pro Arg Ser Leu Ala Ala Asn Ala
    130                 135                 140

Asp Phe Phe Thr Arg His Gly Leu Asp Asp Arg Val Gly Val Leu Gly
145                 150                 155                 160

Phe Asp Tyr Pro Ala Arg Thr Val Asn Val Tyr Phe Asn Asp Val Pro
                165                 170                 175

Arg Glu Cys Phe Glu Pro Glu Thr Ile Arg Ser Thr Leu Arg Arg Thr
            180                 185                 190

Gly Met Ala Glu Pro Ser Glu Gln Met Leu Arg Leu Gly Thr Gly Ala
        195                 200                 205

Phe Gly Leu Tyr Val Thr Leu Gly Trp Asp Ser Pro Glu Ile Glu Arg
    210                 215                 220

Ile Cys Tyr Ala Ala Ala Thr Thr Asp Leu Thr Thr Leu Pro Val Pro
225                 230                 235                 240

Val Glu Pro Glu Ile Glu Lys Phe Val Lys Ser Val Pro Tyr Gly Gly
                245                 250                 255

Gly Asp Arg Lys Phe Val Tyr Gly Val Ala Leu Thr Pro Lys Gly Glu
            260                 265                 270

Tyr Tyr Lys Leu Glu Ser His Tyr Lys Trp Lys Pro Gly Ala Val Asn
        275                 280                 285

Phe Ile
    290
```

<210> 23
<211> 873
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 23
gtggccgagc tctactcgac catcgaggaa tcggcccggc aactggacgt gccgtgttcg 60

cgcgaccggg tctggcccat cctgtccgcg tacggcgacg cgttcgccca tcccgaggcg 120

gtggtcgcct tccgggtggc gaccgcgctg cgtcacgcgg gcgagctgga ctgccggttc 180

cggacgcatc cggacgaccg ggacccgtac gcctcggcgc tcgcccgggg cctcaccccg 240

cgcacggacc accccgtcgg cgcgctgctc tccgaggtcc accggcgctg cccggtggag 300

agccacggca tcgacttcgg ggtggtcggc ggcttcaaga agatctacgc ggccttcgcc 360

```
ccggacgagc tgcaggtggc cacgtcgctc gccggcattc cggcgatgcc ccgcagcctc    420

gccgcgaacg ccgacttctt cacccggcac ggcctcgacg accgggtcgg cgtgctggga    480

ttcgactacc cggcccggac cgtgaacgtc tacttcaacg acgtgccgcg tgagtgcttc    540

gagccggaga ccatccggtc gacgctgcgc cggaccggga tggccgagcc gagcgagcag    600

atgctccggc tcggcaccgg ggcgttcggg ctctacgtca cgctgggctg ggactccccg    660

gagatcgagc ggatctgcta cgccgcggcg accacggacc tgaccacgct tccggtaccc    720

gtggaaccgg agatcgagaa gttcgtgaaa agcgttccgt acggcggcgg ggaccggaag    780

ttcgtctacg gcgtggcgct gacccccaag ggggagtact acaaactcga gtcgcactac    840

aaatggaagc cgggcgcggt gaacttcatt tga                                 873
```

<210> 24
<211> 370
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 24

```
Val Trp Ala Arg Val Lys Asn Trp Val Val Ala Leu Ala Val Ala Ala
1               5                  10                  15

Val Leu Met Ile Ser Ala Leu Ala Gly Asp His Pro Ala Pro Glu Gly
            20                  25                  30

Leu Gly Leu Leu Gly Phe Ala Leu Val Ala Ala Ser Gly Leu Ala Leu
        35                  40                  45

Ala Ala Ser Arg Arg Ala Pro Ile Ala Val Leu Val Ala Thr Gly Leu
    50                  55                  60

Cys Val Val Gly Tyr Asn Ala Ile Gly Phe Gly Val Pro Ala Ile Ala
65                  70                  75                  80

Tyr Leu Phe Ala Val Tyr Ala Ala Val Arg Ala Gly His Arg Leu Val
                85                  90                  95

Thr Leu Gly Ala Ser Ala Ala Leu Leu Val Val Leu Pro Leu Ala Ile
            100                 105                 110

Met Val Ser Pro Ala Asp Gly Ala Leu Lys Glu Ala Leu Ala Gln Ser
        115                 120                 125

Arg Gly Val Leu Glu Leu Ala Trp Leu Ile Ala Ala Ala Ala Ala Gly
    130                 135                 140

Glu Ala Leu Arg Gln Ala Glu Arg Arg Ala Asp Glu Ala Glu Arg Thr
145                 150                 155                 160
```

```
Arg Glu Glu Thr Ala Arg Leu Arg Ala Thr Gln Glu Arg Leu His Ile
                165                 170                 175

Ala Arg Glu Leu His Asp Ser Leu Thr His Gln Ile Ser Ile Ile Lys
            180                 185                 190

Val Gln Ala Glu Val Ala Val His Leu Ala Arg Lys Arg Gly Glu Gln
        195                 200                 205

Val Pro Glu Ser Leu Leu Ala Ile Gln Glu Ala Gly Arg Ala Ala Thr
    210                 215                 220

Arg Glu Leu Arg Ala Thr Leu Glu Thr Leu Arg Asp Leu Thr Lys Ser
225                 230                 235                 240

Pro Ser His Gly Leu Asp His Leu Pro Glu Leu Leu Ala Gly Ala Glu
                245                 250                 255

Lys Ile Gly Leu Ala Thr Thr Leu Thr Ile Glu Gly Asp Gln Arg Asp
            260                 265                 270

Val Pro Glu Ala Val Gly Arg Thr Ala Tyr Arg Ile Val Gln Glu Ser
        275                 280                 285

Leu Thr Asn Thr Ala Arg His Ala Ser Ala Ala Ala Ala Ala Val Arg
    290                 295                 300

Ile Asp Tyr Arg Pro Asp Ala Leu Ser Ile Arg Ile Asp Asp Asp Gly
305                 310                 315                 320

Thr Ala Arg Pro Gly Ala Ala Pro Val Pro Gly Val Gly Leu Leu Gly
                325                 330                 335

Met His Glu Arg Val Leu Ala Leu Gly Gly Arg Leu Arg Ala Glu Pro
            340                 345                 350

Arg Thr Gly Gly Gly Phe Thr Val Gln Ala Glu Leu Pro Val Val Arg
        355                 360                 365

Val Pro
    370
```

<210> 25
<211> 1113
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 25

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gtgtgggccc gggtgaagaa ctgggtcgtc gcgttggctg tggcggcggt gctgatgatc     60

agcgcgctgg ccggtgacca tcctgccccc gagggcctcg gtctgctcgg cttcgcgctg    120

gtggcggcga gcggcctggc gctggccgcc agtcgtcggg ccccgatcgc cgtgctggtc    180

gccaccgggc tgtgcgtggt gggctacaac gcgatcggct tcggggtgcc cgccatcgcg    240

tacctgttcg cggtctacgc ggcggtccgg gccgggcacc ggctcgtcac gctcggggcg    300
```

```
agcgccgccc tgctcgtcgt cctgccgctg gcgatcatgg tctcgcccgc ggacggcgcc    360

ctcaaggagg cgctcgcgca gtcgcggggc gtgctggaac tggcctggct gatcgccgcg    420

gcggcggccg gtgaggcgct gcggcaggcc gaacggcgag cggacgaggc ggaacggacc    480

cgcgaggaga ccgcccggct gcgcgccacc caggagcggc tgcacatcgc acgggagctg    540

cacgactcgc tcacccacca gatctcgatc atcaaggtgc aggcggaggt ggcggtccac    600

ctggcccgca agcggggcga gcaggtgccg gagtcgctgc tggcgatcca ggaggccggc    660

cgggcggcga ctcgcgagct gcgcgcgacc ctggagacgc tgcgtgacct gaccaagtcc    720

ccgtcgcacg ggctcgacca cctcccggag ctgctggccg gggccgagaa gatcggcctg    780

gccaccacgc tgaccatcga gggcgaccag cgggacgtgc cggaggcggt gggccgcacc    840

gcgtaccgga tcgtgcagga gtcgctcacc aacaccgccc ggcacgcctc cgccgcggcc    900

gccgcggtcc ggatcgacta ccgcccggac gcgctgagca tccggatcga cgacgacggg    960

acggcccggc cgggcgccgc cccggtgccc ggcgtcgggc tgctggggat gcacgagcgc   1020

gtcctcgcgc tgggcggccg gctgcgggcg gaaccccgca ccggcggagg cttcaccgtc   1080

caggccgaac tcccggtggt gcgcgtccca tga                                1113
```

<210> 26
<211> 220
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 26

```
Met Ile Arg Ile Met Leu Leu Asp Asp Gln Pro Leu Leu Arg Ser Gly
1               5                  10                  15

Phe Arg Ala Leu Leu Asp Ala Glu Asp Asp Ile Glu Val Val Ala Glu
            20                  25                  30

Gly Gly Asn Gly Arg Glu Gly Leu Ala Leu Ala Arg Gln His Leu Pro
        35                  40                  45

Asp Leu Ala Leu Ile Asp Ile Gln Met Pro Val Met Asp Gly Val Glu
    50                  55                  60

Thr Thr Arg Gln Ile Val Ala Asp Pro Ala Leu Ala Gly Val Arg Val
65                  70                  75                  80

Val Ile Leu Thr Asn Tyr Gly Leu Asp Glu Tyr Val Phe His Ala Leu
                85                  90                  95

Arg Ala Gly Ala Thr Gly Phe Leu Val Lys Asp Ile Glu Pro Asp Asp
            100                 105                 110
```

```
Leu Leu His Ala Val Arg Val Ala Ala Arg Gly Asp Ala Leu Leu Ala
        115                 120                 125

Pro Ser Ile Thr Arg Met Leu Ile Asn Arg Tyr Val Ser Glu Pro Leu
    130                 135                 140

Cys Ala Asp Val Thr Pro Gly Met Glu Glu Leu Thr Asn Arg Glu Arg
145                 150                 155                 160

Glu Ala Val Ala Leu Ala Ala Arg Gly Leu Ser Asn Asp Glu Ile Ala
                165                 170                 175

Asp Arg Met Val Ile Ser Pro Leu Thr Ala Lys Thr His Val Asn Arg
            180                 185                 190

Ala Met Thr Lys Leu Gln Ala Arg Asp Arg Ala Gln Leu Val Val Phe
        195                 200                 205

Ala Tyr Glu Ser Gly Leu Val Ser Pro Gly Asn Arg
    210                 215                 220
```

<210> 27
<211> 663
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 27
atgatcagga tcatgctgct cgacgaccag ccgctgctgc gcagcgggtt ccgcgcgctc 60

ctcgacgccg aggacgacat cgaggtggtg gccgagggcg ggaacggccg ggagggcctg 120

gcgctggccc ggcagcacct gcccgatctc gccctgatcg acatccagat gccggtcatg 180

gacggcgtcg agacgacccg gcagatcgtc gcggatccgg cgctggccgg ggtacgcgtc 240

gtcatcctca ccaactacgg cctcgacgag tacgtcttcc acgcgctgcg cgccggcgcc 300

accggcttcc tggtcaagga catcgagccg gacgacctgc tgcacgccgt gcgggtcgcc 360

gcgcgcggtg acgcgctgct cgcgccgtcg atcacccgga tgctgatcaa caggtacgtg 420

tcggagccgc tctgcgcgga cgtcacgccc ggcatggagg agctgaccaa ccgggaacgc 480

gaggcggtcg ccctggccgc ccggggcctg tccaacgacg agatcgccga tcgcatggtg 540

atcagcccgc tgaccgcgaa gacccacgtc aaccgcgcca tgaccaagct gcaggcccgc 600

gaccgcgccc agctggtggt gttcgcctac gagtccggcc tggtgtcacc cggcaatcgc 660

tga 663

<210> 28
<211> 131
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 28

```
Met Phe Ile Arg Arg Leu Leu Thr Ala Ala Ala Ala Gly Val Leu Gly
1               5                  10                  15

Gly Leu Ala Leu Val Ala Pro Ala Ala Ala Gln Val Thr Ala Ala Asp
            20                  25                  30

Gly Asp Gly Gly Ser Gly Arg Ala Gly Ser Val Leu Ala Leu Ala Leu
        35                  40                  45

Ala Leu Leu Gly Leu Val Leu Gly Gly Trp Ala Leu Arg Ser Ala Gly
    50                  55                  60

Arg Gly Gly Gly Arg Gly Asn Ala Ile Ala Ala Leu Val Leu Ala Val
65                  70                  75                  80

Ala Gly Leu Ile Ala Gly Val Val Ala Leu Ala Gly Ser Asp Gly Gly
                85                  90                  95

Val Gly Ser Gly Asn Gly Arg Gly Gly Ala Ile Val Ala Val Val Leu
            100                 105                 110

Ala Leu Ile Gly Ile Ala Val Gly Gly Leu Ala Phe Thr Arg Ser Arg
        115                 120                 125

Arg Ala Ala
    130
```

<210> 29
<211> 396
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 29

```
atgttcatcc gtcgtttgct caccgccgcc gcagccggcg tcctcggtgg gctcgcactc     60

gtcgcaccgg cggccgcgca ggtgacggcc gccgacggtg acggtggttc cggccgcgcc    120

ggatccgtgc tggcgctcgc gctcgcgttg ctcggcctcg tcctgggcgg gtgggcgttg    180

cgctccgcgg ggcgcggcgg cggtcgtggc aacgcgatcg ccgcgctggt gctcgcggtg    240

gccggcctga tcgccggcgt ggtcgccctg gccggctccg acggtggtgt cggcagcggc    300

aacggccgtg gtggcgccat cgtggccgtc gtgctggcgc tgatcgggat cgccgtcggc    360

ggcctggcat tcacccgctc ccggcgcgcc gcctga                              396
```

<210> 30
<211> 154
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 30

```
Met Arg Lys Val Phe Ala Gly Leu Ala Ala Phe Leu Leu Leu Val Leu
1               5                  10                  15

Val Val Gln Phe Phe Leu Ala Ala Ser Gly Ala Phe Ser Asn Glu Ala
            20                  25                  30

Asn Glu Glu Ala Phe Arg Pro His Arg Ile Leu Gly Leu Gly Ser Ile
        35                  40                  45

Leu Val Ala Val Val Leu Thr Val Ala Ala Ala Val Met Arg Met Pro
    50                  55                  60

Gly Arg Ile Ile Gly Leu Ser Gly Leu Val Ala Gly Leu Gly Ile Leu
65                  70                  75                  80

Gln Ala Leu Ile Ala Val Ile Ala Lys Ala Phe Gly Asp Ser Ala Gly
                85                  90                  95

Asp Ser Ala Val Gly Arg Tyr Val Phe Gly Leu His Ala Val Asn Gly
            100                 105                 110

Leu Val Met Val Ala Val Ala Arg Val Ile Leu Arg Ser Val Arg Ala
        115                 120                 125

Ala Pro Asp Thr Thr Thr Thr Pro Gly Val Asp Thr Thr Val Thr Gly
    130                 135                 140

Pro Ala Ala Asp Ser Ala Arg Thr Ala Ser
145                 150
```

<210> 31
<211> 465
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 31
atgcgcaaag tgttcgccgg actggcagcg ttcctgctgc tcgtgctcgt ggtgcagttc 60

ttcctggccg ccagcggcgc gttcagcaac gaggccaacg aggaggcgtt ccgccctcac 120

cggatcctgg gcctggggag catcctcgtc gccgtggtgc tgacggtggc cgccgcggtg 180

atgcggatgc ccggccggat catcggcctg tccggcctgg tcgccgggct gggcatcctg 240

caggccctga tcgcggtcat cgccaaggcg ttcggcgact cggccggtga ctcggccgtc 300

ggccggtacg tgttcggcct gcacgcggtc aacggactgg tgatggtggc cgtcgcccgc 360

gtcatcctgc gcagcgtccg ggcggcgccg gacacgacca ccacgcccgg cgtggacacg 420

acggtcaccg gtccggcggc cgactcggcg cgaacggcgt catga 465

<210> 32
<211> 661
<212> PRT

<213> Micromonospora sp. strain 046-ECO11

<400> 32

```
Met Ser Thr Leu Gln Trp Ile Leu Val Asp His Val Val Ala Leu Leu
1               5                  10                  15

Gly Val Ala Thr Trp Phe Ala Thr Gly Val Thr Ala Ala Leu Gly Arg
            20                  25                  30

His Arg Ile Ala Leu Ala Leu Leu Gly Ala Ala Val Leu Val Thr Val
        35                  40                  45

Ala Arg Leu Gly Thr Val Ala Leu Leu Ala Asp Arg Gly Trp Trp Phe
    50                  55                  60

Val Gln Glu Lys Val Leu Leu Gly Leu Pro Met Leu Gly Ala Ala Gly
65                  70                  75                  80

Leu Val Ala Val Leu Leu Ala Gly Pro Arg Leu Leu Ala Ala Arg Gln
                85                  90                  95

Ser Pro Ala Ala Asp Leu Pro Ala Gly Ala Leu Val Ala Val Leu Thr
            100                 105                 110

Ala Gly Phe Ala Ala Leu Ala Gly Leu Val Val Thr Phe Thr Ala Gly
        115                 120                 125

Tyr Pro Leu Thr Trp Ser Thr Ala Leu Ile Ala Val Ala Leu Val Cys
    130                 135                 140

Ala Ala Ala Leu Leu Thr Ala Arg Val Val Gly Arg Pro Ala Ala Pro
145                 150                 155                 160

Ala Ala Glu Ala Gly Ser Pro Glu His Thr Pro Ala Ala Ala Gly Pro
                165                 170                 175

Thr Ala Leu Ser Arg Arg Arg Phe Leu Gly Val Ala Gly Gly Val Val
            180                 185                 190

Ala Ala Gly Ala Gly Ala Thr Gly Val Gly Leu Leu Phe Arg Asp Pro
        195                 200                 205

Glu Ala Met Val Thr Gly Gly Gly Pro Gly His Ala Gly Gly Ala Arg
    210                 215                 220

Pro Lys Val Ser Val Ala Asp Leu Arg Gly Pro Gly Ala Pro Ala Ala
225                 230                 235                 240

Gly Gly Thr Ala Arg Arg His Val Leu Thr Ala Arg Thr Gly Thr Val
                245                 250                 255

Thr Ile Pro Ser Gly Arg Pro Ile Asp Ala Trp Ser Tyr Glu Gly Arg
            260                 265                 270

Leu Pro Gly Pro Ala Ile Thr Ala Thr Glu Gly Asp Leu Ile Glu Val
        275                 280                 285
```

```
Thr Leu Arg Asn Ala Asp Ile Glu Asp Gly Val Thr Val His Trp His
    290                 295                 300

Gly Tyr Asp Val Pro Cys Gly Glu Asp Gly Ala Pro Gly Ala Thr Gln
305                 310                 315                 320

His Ala Val Gln Pro Gly Gly Glu Phe Val Tyr Arg Phe Gln Ala Asp
                325                 330                 335

Gln Val Gly Thr Tyr Trp Tyr His Thr His Gln Ala Ser His Pro Ala
            340                 345                 350

Val Arg Lys Gly Leu Tyr Gly Thr Leu Val Val Thr Pro Arg Glu Asp
        355                 360                 365

Arg Pro Glu Ala Glu Arg Gly Leu Asp Leu Thr Leu Pro Val His Thr
    370                 375                 380

Phe Asp Asp Val Thr Ile Leu Gly Asp Gln Glu Gly Arg Ala Val His
385                 390                 395                 400

Asp Val Arg Pro Gly Gln Pro Val Arg Leu Arg Leu Ile Asn Thr Asp
                405                 410                 415

Ser Asn Pro His Trp Phe Ala Val Val Gly Ser Pro Phe Arg Val Val
            420                 425                 430

Ala Val Asp Gly Arg Asp Leu Asn Gln Pro Gly Glu Val Arg Glu Val
        435                 440                 445

Gly Leu Arg Leu Pro Ala Gly Gly Arg Tyr Asp Leu Thr Leu Ala Met
    450                 455                 460

Pro Asp Ala Lys Val Thr Leu Leu Leu Asp Asn Asp Ser Asp Gln Gly
465                 470                 475                 480

Val Leu Leu Arg Pro Pro Gly Val Gly Gly Gly Asp Arg Pro Leu Pro
                485                 490                 495

Asp Thr Ala Asp Trp Pro Glu Phe Asp Leu Leu Gly Tyr Gly Glu Pro
            500                 505                 510

Ala Pro Val Pro Phe Asp Ala Asp Asp Ala Asp Arg His Phe Thr Ile
        515                 520                 525

Val Leu Asp Arg Ala Leu Ala Met Val Asp Gly Lys Pro Ala Tyr Ala
    530                 535                 540

Gln Thr Val Asp Gly Arg Ala His Pro Ser Val Pro Asp Gln Leu Val
545                 550                 555                 560

Arg Glu Gly Asp Val Val Arg Phe Thr Val Val Asn Arg Ser Leu Glu
                565                 570                 575

Thr His Pro Trp His Leu His Gly His Pro Val Leu Ile Leu Ser Arg
            580                 585                 590
```

Asp Gly Arg Pro Tyr Ser Gly Ser Pro Leu Trp Met Asp Thr Phe Asp
595 600 605

Val Arg Pro Gly Glu Val Trp Glu Val Ala Phe Arg Ala Asp Asn Pro
610 615 620

Gly Val Trp Met Asn His Cys His Asn Leu Pro His Gln Glu Gln Gly
625 630 635 640

Met Met Leu Arg Leu Val Tyr Asp Gly Val Thr Thr Pro Phe Ala Ser
645 650 655

Thr Ser His Ala His
660

<210> 33
<211> 1986
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 33
atgagcacgc tccaatggat cctcgtggac cacgtcgtgg cgctgctcgg tgtcgcgacg 60

tggttcgcaa cgggtgtcac ggcagctctc ggccgccacc ggatcgcgtt ggcgctcctc 120

ggcgccgcgg tgctggtgac agtcgcccgc ctgggcaccg tggcgctgct ggccgaccgc 180

ggctggtggt tcgtccagga gaaggttctg ctggggctgc cgatgctcgg cgccgcgggg 240

ctcgtcgcgg tgctcctggc cggcccgcgc ctgctcgcgg cccggcagtc accggcggcg 300

gacctgccgg ccggcgcgct ggtcgcggtg ctgaccgccg gcttcgccgc gctggccggc 360

ctggtggtga cgttcaccgc cgggtacccg ctgacgtgga gcaccgcgct gatcgccgtc 420

gccctcgtct gcgccgccgc gctgctcacc gcgcgggtgg tcggacgacc cgccgccccg 480

gccgcggagg ccggctcccc ggagcacacg ccggcggcgg ccgggcccac ggcgctgtcc 540

cgccgccggt tcctcggcgt ggccgggggа gtggtcgcgg cgggcgccgg cgccaccggc 600

gtcggcctgc tcttccgcga cccggaggcg atggtcaccg gaggcggccc cggacacgcc 660

ggtggcgccc gccccaaggt ctccgtggcg gacctgcgcg gccccggcgc tccggcggcg 720

ggcggcacgg cgcgacgcca cgtgctcacc gcccggacgg gcaccgtcac gattccgtcc 780

ggacgtccga tcgacgcctg gagctacgag ggccgcctgc ccgggccggc catcaccgcg 840

accgagggcg acctgatcga ggtgacgctc cgcaacgccg acatcgagga cggcgtcacc 900

gtgcactggc acgggtacga cgtgccgtgc ggcgaggacg gcgcgccggg cgccacgcag 960

cacgcggtgc agcccggcgg cgagttcgtc taccggttcc aggcggacca ggtggggacg 1020

tactggtacc acacccacca ggcgtcgcac cccgccgtgc gcaaagggct gtacgggacg 1080

ctcgtcgtga cgccgcgcga ggaccggccg gaagcggagc gcgggctgga cctgacgctg 1140

ccggtgcaca cgttcgacga cgtcacgatc ctcggcgacc aggagggacg cgccgtccac 1200

gacgtccgcc ccggccagcc ggtgcgactg cgtctgatca acaccgactc caacccgcac 1260

tggttcgccg tcgtcggctc gcccttccgc gtggtggccg tcgacggccg cgacctcaac 1320

cagccgggcg aggtacgcga ggtcgggctc cgcctgcccg ccggaggccg gtacgacctg 1380

accctggcca tgccggacgc caaggtcacg ctgctgctcg acaacgactc cgaccagggc 1440

gtcctgctgc gcccgccggg cgtcggcggt ggtgaccgcc cgctgccgga caccgccgac 1500

tggcccgagt tcgacctgct gggctacggc gagccggcgc ccgtgccgtt cgacgccgac 1560

gacgccgacc gccacttcac catcgtcctc gaccgggccc tggccatggt cgacggcaag 1620

cccgcgtacg cccagaccgt cgacggtcgc gcacatccct ccgtccccga ccagctcgtc 1680

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cacctgcacg gccatccggt gctgatcctg tcccgcgacg gccggccgta ctccggcagc 1800

ccgctgtgga tggacacctt cgacgtgcgg ccgggagagg tgtgggaggt ggcgttccgg 1860

gcggacaatc cgggtgtctg gatgaaccac tgccacaacc tgccgcacca ggagcagggc 1920

atgatgctgc ggctcgtcta cgacggtgtc accacgccct tcgccagcac gagccacgca 1980

cactga 1986

<210> 34
<211> 129
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 34

Met Thr Ala Asp Leu His Gly Leu Ala Ser Val Arg Tyr Ile Val Asp
1 5 10 15

Asp Val Ser Ala Ala Ile Glu Phe Tyr Thr Thr His Leu Gly Phe Thr
20 25 30

Val Ser Thr Ala Phe Pro Pro Ala Phe Ala Asp Val Val Arg Gly Pro
35 40 45

Leu Arg Leu Leu Leu Ser Gly Pro Thr Ser Ser Gly Ala Arg Val Thr
50 55 60

Pro Ala Asp Ala Ala Gly Cys Gly Arg Asn Arg Ile His Leu Ile Val
65 70 75 80

Asp Asp Leu Asp Ala Glu Arg Glu Arg Leu Glu Arg Ala Gly Val Thr

```
                85                  90                  95

Leu Arg Ser Asp Val Val Ala Gly Pro Gly Gly Arg Gln Phe Leu Ile
            100                 105                 110

Ala Asp Pro Ala Gly Asn Leu Val Glu Val Phe Glu Pro Ala Ala Arg
        115                 120                 125

Gly
```

<210> 35
<211> 390
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 35

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atgaccgcag acctgcacgg cctggccagc gtccgctaca tcgtcgacga cgtgtcggcg     60

gcgatcgagt tctacaccac ccacctgggt ttcacggtgt cgaccgcgtt cccgccggcc    120

ttcgccgacg tggtgcgcgg gccgctgcgg ctcctgctgt ccgggccgac cagctcgggc    180

gcccgggtca ccccggcgga cgcggccggg tgcgggcgca accgcatcca cctgatcgtc    240

gacgatctcg acgccgaacg ggagcggctg gagcgcgccg gggtgacgtt gcgcagcgac    300

gtcgtggccg ggccgggcgg ccgtcagttc ctgatcgccg acccggcggg caacctggtc    360

gaggtgttcg agccggcagc ccgcggctga                                     390
```

<210> 36
<211> 178
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 36

```
Met Leu Thr Ala Val Val Ala Ser Pro His Ser Pro Glu Asn Thr Ser
1               5                   10                  15

Arg His Pro Thr Gly Gly Asp Ala Val Asp Glu Ala Thr Pro Arg Thr
            20                  25                  30

Pro Val Ala Ala Arg Pro Thr Trp Ser Pro Ala Thr Ala Pro Val Trp
        35                  40                  45

Leu Val Gly Val Leu Ala Thr Leu Ala Gly Ala Val Ala Ala Glu Ala
    50                  55                  60

Phe Thr Leu Ala Ala Arg Gly Phe Gly Val Pro Met Glu Ala Ala Gly
65                  70                  75                  80

Val Trp Glu Glu Gln Ala Gln Ala Ile Pro Val Gly Ala Ile Ala Arg
                85                  90                  95
```

```
Ser Val Val Leu Trp Ser Ile Gly Gly Ile Val Leu Ala Val Val Val
            100                 105                 110

Ala Arg Arg Ala Arg Arg Pro Val Arg Ala Phe Val Ala Gly Thr Val
        115                 120                 125

Ala Phe Thr Val Leu Ser Leu Ala Ala Pro Ala Phe Ala Arg Asp Thr
    130                 135                 140

Pro Val Ser Thr Gln Leu Val Leu Ala Gly Thr His Val Ile Ala Gly
145                 150                 155                 160

Ala Val Ile Ile Ser Ile Leu Ala Ala Arg Leu Ala Ala Pro Thr Pro
                165                 170                 175

Pro Arg
```

<210> 37
<211> 537
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 37

```
atgttgactg ccgtcgtggc gtccccgcat tctcccgaga acacatcgag gcacccgacc     60

ggaggcgacg ccgtggatga ggccactccc cgaactcccg tcgcggcacg gcccacctgg    120

tcgccggcca ccgctccggt gtggctggtc ggcgtgctgg ccaccctcgc cggggccgtg    180

gccgcggagg cgttcacgct cgccgcccgg ggcttcggcg taccgatgga ggcggccggc    240

gtctgggagg agcaggcgca ggcgatcccg gtgggggcca tcgcccgcag cgtcgtgctc    300

tggtcgatcg gcggaatcgt cctggcggtg gtcgtggcgc ggcgggcccg gcggcccgtg    360

cgtgccttcg tggccggcac cgtcgcgttc accgtgctgt ccctcgccgc gcccgccttc    420

gcccgggaca ccccggtgtc gacgcagctc gtcctcgccg gcacccacgt gatcgccggc    480

gccgtgatca tctccatcct ggccgcgcgg ctcgccgcgc ccaccccgcc ccggtaa       537
```

<210> 38
<211> 661
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 38

```
Met Asp Gly Thr Glu Ser Asn Val Thr Gly Phe Pro Asp Leu Leu Ser
1               5                   10                  15

Gly Leu Gly Gly Asp Gly Arg Ala Phe Ala Leu Leu His Arg Pro Gly
            20                  25                  30

Ala Ala Gly Cys Ala Tyr Val Glu Val Leu Thr Gly Glu Val Cys Asp
```

```
        35                  40                  45

Val Asp Thr Leu Gly Glu Leu Pro Leu Pro Thr Glu Pro Ala Thr Gly
    50                  55                  60

Ala Arg His Asp Leu Leu Val Ala Val Pro Tyr Arg Gln Val Thr Glu
65                  70                  75                  80

Arg Gly Phe Asp Cys His Asp Asp Gly Ala Pro Leu Leu Ala Met Arg
                85                  90                  95

Val His Glu Gln Phe Gly Leu Asp Arg Gly Gln Ala Leu Ala Gly Leu
            100                 105                 110

Pro Glu Arg Gly Val Pro Val Thr Asp Ala Asp Phe Asp Leu Ser Asp
        115                 120                 125

Glu Asp Tyr Ala Ala Ile Val Lys Arg Val Val Gly Asp Glu Ile Gly
    130                 135                 140

Leu Gly Ala Gly Ser Asn Phe Val Ile Arg Arg Thr Phe Thr Ala Arg
145                 150                 155                 160

Leu Ala Asp Tyr Ser Ile Ala Thr Glu Leu Ala Leu Phe Arg Arg Leu
                165                 170                 175

Leu Thr Gly Glu Leu Gly Ser Tyr Trp Thr Phe Leu Phe His Ser Gly
            180                 185                 190

Ala Gly Thr Phe Ile Gly Ala Ser Pro Glu Arg His Val Ser Met Ile
        195                 200                 205

Asp Gly Thr Val Ser Met Asn Pro Ile Ser Gly Thr Tyr Arg His Pro
    210                 215                 220

Pro Asn Gly Pro Ala Val Ser Gly Leu Leu Glu Phe Leu Asn Asp Pro
225                 230                 235                 240

Lys Glu Ala Asn Glu Leu Tyr Met Val Val Asp Glu Glu Leu Lys Met
                245                 250                 255

Met Ala Arg Met Cys Ala Ser Gly Gly Gln Val His Gly Pro Phe Leu
            260                 265                 270

Lys Glu Met Ala Arg Val Thr His Ser Glu Tyr Ile Leu Thr Gly Arg
        275                 280                 285

Ser Asp Leu Asp Val Arg Asp Val Leu Arg Glu Thr Leu Leu Ala Pro
    290                 295                 300

Thr Val Thr Gly Ser Pro Ile Glu Asn Ala Phe Arg Val Ile Thr Arg
305                 310                 315                 320

His Glu Thr Thr Gly Arg Gly Tyr Tyr Gly Gly Val Leu Ala Leu Met
                325                 330                 335

Gly Arg Asp Ser Ala Gly Ser Arg Thr Leu Asp Ser Ala Ile Met Ile
```

```
            340                 345                 350

Arg Thr Ala Glu Ile Asp Asp Ala Gly Thr Leu Arg Leu Gly Val Gly
        355                 360                 365

Ala Thr Leu Val Arg Asp Ser Lys Pro Glu Ser Glu Val Ala Glu Thr
    370                 375                 380

Arg Ala Lys Ala Gly Ala Met Arg Ala Ala Leu Gly Leu Gly Val Asp
385                 390                 395                 400

Pro Asp Gly Pro Asp Gly Gly Arg Thr Thr Ala Ala Arg Ala Arg Ser
                405                 410                 415

Ser Leu Ala Thr Asp Pro Arg Val Arg Arg Ala Leu Arg Glu Arg Asn
            420                 425                 430

Thr Thr Leu Ser Arg Phe Trp Leu Asp Gly Ala Glu Arg Arg Thr Pro
        435                 440                 445

Asn Pro Ala Leu Thr Gly Arg Arg Val Leu Val Val Asp Asn Glu Asp
    450                 455                 460

Thr Phe Met Ala Met Leu Asp His Gln Leu Arg Ala Leu Gly Leu Arg
465                 470                 475                 480

Ser Ser Ile Ala Arg Phe Asp Ser Arg Leu Arg Pro Asp Gly His Asp
                485                 490                 495

Leu Val Val Val Gly Pro Gly Pro Gly Asp Pro Gly Asp Leu Thr Asp
            500                 505                 510

Pro Arg Met Arg Thr Leu Arg Gly Leu Thr Arg Asp Leu Leu Ala Gly
        515                 520                 525

Thr Val Pro Phe Leu Ser Ile Cys Leu Gly His Gln Val Leu Ala Ala
    530                 535                 540

Glu Leu Gly Phe Pro Leu Ala Arg Arg Ala Val Pro Asn Gln Gly Val
545                 550                 555                 560

Gln Lys Arg Ile Asp Leu Phe Gly Arg Pro Glu Leu Val Gly Phe Tyr
                565                 570                 575

Asn Thr Tyr Thr Ala Arg Ser Ala His Asp Val Val Ala Gly Gly Arg
            580                 585                 590

Arg Gly Pro Ile Glu Ile Ser Arg Ser Pro Asp Ser Gly Asp Val His
        595                 600                 605

Ala Leu Arg Gly Pro Gly Phe Arg Ser Val Gln Phe His Leu Glu Ser
    610                 615                 620

Val Leu Thr Gln His Gly Pro Arg Ile Leu Gly Asp Leu Leu Val Ser
625                 630                 635                 640

Leu Leu Ala Asp Gly Thr Ala Ala Ala Ala Ala Glu Ala Ala Gly Arg
```

645 650 655

Arg Gly Asn Arg Pro
660

<210> 39
<211> 1986
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 39
atggacggga cggaatcgaa cgtgaccgga ttccccgatc tgctgtccgg tctcggcggc 60

gacgggcgcg ccttcgccct gctgcaccgg cccggcgcgg ccgggtgcgc gtacgtggag 120

gttctgaccg gcgaggtgtg cgacgtggac actctcggcg agctgcccct gcccaccgag 180

ccggcgaccg gcgcgcggca cgacctgctc gtggcggtgc cgtaccggca ggtcaccgaa 240

cgggggttcg actgccacga cgacggcgcg ccgctgctcg cgatgcgcgt ccacgagcag 300

ttcgggctcg accgcggaca ggcgctggcg ggcctgcccg aacgcggtgt gccggtgacc 360

gacgccgact tcgacctcag cgacgaggac tacgccgcga tcgtcaagcg ggtggtgggt 420

gacgagatcg ggctgggcgc cggatccaac ttcgtcatcc ggcgcacctt caccgcgcgg 480

ctggccgact actcgatcgc cacggaactg gcgctcttcc gccggttgct gaccggcgaa 540

ctgggttcct actggacgtt tctgttccac tccggcgccg gcacgttcat cggcgcgtca 600

ccggaacgac acgtcagcat gatcgacgga accgtctcga tgaatcccat cagcgggacc 660

taccggcacc ccccgaacgg cccggccgtt tccggtctgc tggaattcct gaacgacccg 720

aaagaggcta acgaactcta catggtcgtc gacgaggaac tgaaaatgat ggcgcggatg 780

tgcgcctccg gcggccaggt gcacggcccg ttcctcaagg aaatggcgcg ggtgacgcac 840

tccgagtaca tcctgaccgg ccgcagcgac ctggacgtgc gcgacgtgct gcgggagacc 900

ctgctcgcgc cgacggtcac cggcagcccg atcgagaacg cgttccgggt catcacccgc 960

cacgagacga ccggccgcgg ctactacggc ggcgtgctcg cgttgatggg ccgtgactcg 1020

gccggcagcc gtacgctcga ctcggccatc atgatccgca ccgccgagat cgacgacgcg 1080

ggcacgctgc gcctgggcgt cggcgccacc ctcgtgcggg actccaagcc ggagtcggag 1140

gtggccgaga cgcgggccaa ggcgggcgcc atgcgcgcgg cgctcggcct cggcgtcgac 1200

ccggacggcc cggacggcgg gcggaccacg gccgcgcggg ctcgttcgtc cctggccacc 1260

gacccccggg tacggcgggc gttgcgcgag cgcaacacca cactgtcgag gttctggctc 1320

gacggcgcgg agcggcgcac cccgaacccg gcgctgaccg gacgccgcgt gctcgtcgtc 1380

gacaacgagg acacgttcat ggccatgctc gaccaccagt tgcgggccct cgggctgcgg 1440

tcgagcatcg cccggttcga cagccggctg cggccggacg gacacgacct cgtcgtcgtc 1500

ggtcccggcc ccggcgaccc gggcgacctg accgacccgc gtatgcggac cctgcgcggg 1560

ctcacccgcg acctgctcgc cggaacggtg ccgttcctgt ccatctgcct gggccaccag 1620

gtgctcgccg ccgaactggg gttccccctc gcccggcgcg cggtgcccaa ccagggtgtg 1680

cagaagcgga tcgacctgtt cggccggccg gaactcgtgg ggttctacaa cacctacacc 1740

gcccgctccg cgcacgacgt ggtggccggt ggccggcggg gcccgatcga gatcagccgc 1800

agcccggaca gcggggacgt gcacgcgctg cgcggcccgg gattccgttc cgtccagttc 1860

cacctggagt ccgtcctcac ccagcacggc ccacggatcc tgggcgacct gctggtctcc 1920

ctgctcgccg acggcacggc cgccgccgcg gccgaggcgg cgggccggcg cgggaaccgc 1980

ccgtga 1986

<210> 40
<211> 427
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 40

Val Lys Thr Thr Val Asp Val Leu Val Gln Lys Tyr Gly Gly Thr Ser
1 5 10 15

Leu Gln Thr Leu Asp Arg Val Arg His Ala Ala Leu Arg Ile Ala Glu
20 25 30

Ala Arg Arg His Gly Ser Ala Val Thr Val Val Val Ser Ala Arg Gly
35 40 45

Ser Arg Thr Asp Asp Leu Leu Arg Leu Ala Ala Asp Val Gly Ala Ala
50 55 60

Gly Pro Ser Arg Glu Leu Asp Gln Leu Leu Ala Val Gly Glu Ser Glu
65 70 75 80

Ser Ala Ala Leu Met Ala Leu Ala Leu Thr Gly Leu Gly Val Pro Ala
85 90 95

Val Ser Leu Thr Gly His Gln Ala Glu Ile His Thr Thr Asp Arg His
100 105 110

Gly Asp Ala Leu Ile Ser Arg Ile Gly Ala Ala Arg Val Glu Ala Ala
115 120 125

Leu Gly Arg Gly Glu Val Ala Val Val Thr Gly Phe Gln Gly Ile Asp
130 135 140

```
Arg Ala Gly Asp Val Ala Thr Leu Gly Arg Gly Gly Ser Asp Thr Thr
145                 150                 155                 160

Ala Val Ala Leu Ala Ala Arg Leu Arg Ala Ser Ala Cys Glu Ile Tyr
                165                 170                 175

Thr Asp Val Asp Gly Val Phe Ser Ala Asp Pro Arg Ile Leu Pro Ala
            180                 185                 190

Ala Arg Cys Leu Pro Trp Val Glu Pro Gly Val Met Ala Glu Met Ala
        195                 200                 205

Phe Ala Gly Ala Arg Val Leu His Thr Arg Cys Ile Glu Leu Ala Ala
    210                 215                 220

Met Glu Gly Val Glu Val Arg Val Arg Asn Ala Ser Ser Gln Ala Pro
225                 230                 235                 240

Gly Thr Ile Val Val Asp Arg Pro Asp Asp Arg Pro Leu Glu Thr Arg
                245                 250                 255

Arg Ala Val Val Ala Val Thr His Asp Thr Asp Val Val Arg Val Leu
            260                 265                 270

Val His Cys Arg Asp Gly Arg Arg Asp Met Ala Pro Asp Val Phe Glu
        275                 280                 285

Val Leu Ala Ala His Gly Ala Val Ala Asp Leu Val Ala Arg Ser Gly
    290                 295                 300

Pro Tyr Glu Ser Glu Phe Arg Met Gly Phe Thr Ile Arg Arg Ser Gln
305                 310                 315                 320

Ala Glu Ala Val Arg Thr Ala Leu His Asp Leu Thr Ala Ser Phe Asp
                325                 330                 335

Gly Gly Val His Phe Asp Glu Asn Val Gly Lys Val Ser Val Val Gly
            340                 345                 350

Met Gly Leu Leu Ser Arg Pro Glu His Thr Ala Arg Leu Met Ala Ala
        355                 360                 365

Leu Ala Ala Ala Gly Ile Ser Thr Ser Trp Ile Ser Thr Ser Gln Met
    370                 375                 380

Arg Leu Ser Val Ile Val Ser Arg Asp Arg Thr Val Asp Ala Val Glu
385                 390                 395                 400

Ala Leu His Arg Ala Phe Arg Leu Asp Arg Ser Glu Pro Ala Asp Ala
                405                 410                 415

Thr Ser Leu Thr Ser Arg Arg Ser Ala Thr Ala
            420                 425
```

<210> 41
<211> 1284
<212> DNA

<213> Micromonospora sp. strain 046-ECO11

<400> 41
gtgaagacga ctgtggacgt gctggtccag aaatacgggg gcacctcgct gcagaccctc 60

gaccgcgttc ggcacgccgc gctgcggatc gccgaggcgc ggcggcacgg ctccgccgtg 120

acagtggtcg tgtcggcgcg cggcagccgg accgacgacc tgctgcggct ggcggccgac 180

gtcggcgccg cgggtccgtc ccgggaactc gaccagttgc tcgcagtcgg cgagtccgag 240

tcggcggcgc tgatggcgct ggcgttgacc gggctgggag tgccggccgt ctcgctgacc 300

gggcaccagg cggagatcca caccaccgac cggcacggcg acgcgctgat ctcgcggatc 360

ggggcggcgc gggtggaagc ggcgctgggc cgtggcgagg tcgccgtggt caccggattc 420

cagggcatcg accgggccgg tgacgtcgcc acgctggggc gcggcggctc cgacacgaca 480

gcggtggcgc tcgcggcccg gctccgcgcg tcggcgtgcg agatctacac cgacgtggac 540

ggcgtcttca gcgccgaccc ccgcatcctt ccggcggcgc gttgcctgcc gtgggtggag 600

cccggcgtca tggcggagat ggcgttcgcc ggcgcgcggg tcctgcacac ccgatgcatc 660

gagctggccg ccatggaagg ggtcgaagtg cgcgtgcgca acgcgtcgtc gcaggcgccc 720

ggaacgatag tcgtggaccg gcccgacgac cggccgctgg agacccggcg ggccgtggtg 780

gcggtcaccc acgacaccga tgtcgtccgc gtgctggtgc actgccgcga cggccgccgg 840

gacatggcac ccgacgtgtt cgaggtgctg gccgcccatg gggcggtggc ggacctggtg 900

gcccggtccg ggccctacga gagcgagttc cggatggggt tcaccatccg ccgcagccag 960

gccgaagcgg tgcggaccgc gctgcacgac ctcaccgcgt ccttcgacgg cggggtccac 1020

ttcgacgaga acgtcggcaa ggtgtccgtg gtcggcatgg gcctgctcag ccgccccgag 1080

cacacggccc ggctgatggc ggcgctggcc gcggcgggga tctcgacgag ctggatctcc 1140

acctcccaga tgcggctgtc ggtgatcgtg tcgcgggacc gcaccgtcga cgccgtcgaa 1200

gccctgcacc gcgcgttccg cctggaccgg tccgagccgg cggacgccac gtccctgacc 1260

tcccgccgtt ccgccaccgc ctga 1284

<210> 42
<211> 274
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 42

Val Ala Val Leu Asn Ala Ser Phe Ala Arg Gly Leu Arg Leu Arg Arg
1 5 10 15

```
Leu Phe Arg Arg Gly Asp Gly Arg Leu Leu Val Val Pro Leu Asp His
            20                  25                  30

Ser Val Thr Asp Gly Pro Leu Arg Arg Gly Asp Leu Asn Ser Leu Leu
        35                  40                  45

Gly Glu Leu Ala Gly Thr Gly Val Asp Ala Val Val Leu His Lys Gly
    50                  55                  60

Ser Leu Arg His Val Asp His Gly Trp Phe Gly Asp Met Ser Leu Ile
65                  70                  75                  80

Val His Leu Ser Val Ser Thr Arg His Ala Pro Asp Pro Asp Ala Lys
                85                  90                  95

Tyr Leu Val Ala His Val Glu Glu Ala Leu Arg Leu Gly Ala Asp Ala
            100                 105                 110

Val Ser Val His Val Asn Leu Gly Ser Pro Gln Glu Ala Arg Gln Ile
        115                 120                 125

Ala Asp Leu Ala Ala Val Ala Gly Glu Cys Asp Arg Trp Asn Val Pro
    130                 135                 140

Leu Leu Ala Met Val Tyr Ala Arg Gly Pro Gln Ile Thr Asp Ser Arg
145                 150                 155                 160

Ala Pro Glu Leu Val Ala His Ala Ala Thr Leu Ala Ala Asp Leu Gly
                165                 170                 175

Ala Asp Ile Val Lys Thr Asp Tyr Val Gly Thr Pro Glu Gln Met Ala
            180                 185                 190

Glu Val Val Arg Gly Cys Pro Ile Pro Leu Ile Val Ala Gly Gly Pro
        195                 200                 205

Arg Ser Ala Asp Thr Pro Thr Val Leu Ala Tyr Val Ser Asp Ala Leu
    210                 215                 220

Arg Gly Gly Val Ala Gly Met Ala Met Gly Arg Asn Val Phe Gln Ala
225                 230                 235                 240

Glu Gln Pro Gly Leu Met Ala Ala Ala Val Ala Arg Leu Val His Glu
                245                 250                 255

Pro Arg His Val Pro Asp Arg Tyr Asp Val Asp Asp Arg Leu Ala Leu
            260                 265                 270

Thr Ser
```

<210> 43
<211> 825
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 43
gtggccgtac tcaacgcttc gttcgctcgt ggcctgcgtc tgcgccgact gttccgacgc 60

ggcgacggac gcctgctcgt cgtcccgctc gaccactccg tcaccgacgg gccgctgcgc 120

cgcggcgacc tgaactcgct gctcggtgag ctcgccggca ccggcgtgga cgccgtggtg 180

ctgcacaagg gcagcctgcg gcacgtcgac cacggctggt tcggcgacat gtcgctgatc 240

gtgcatctga gcgtgagcac ccggcacgcc ccggacccgg acgcgaagta cctggtcgcg 300

cacgtggagg aggcgctgcg gctgggcgcc gacgcggtca gcgtgcacgt caacctcggc 360

tcaccgcagg aggcgcggca gatcgccgac ctggcggcgg tggcggggga gtgcgaccgc 420

tggaacgtcc cgctgctggc catggtgtac gcccgcgggc cgcagatcac cgactcccgg 480

gcaccggagc tggtggcgca cgccgcgacg ctcgccgcgg acctcggcgc cgacatcgtc 540

aagaccgact acgtgggcac gcccgagcag atggccgagg tggtgcgcgg ctgcccgatc 600

ccgctgatcg tggccggcgg cccgcgctcg gccgacactc cgacggtgct cgcctacgtc 660

tcggacgcgc tgcgcggcgg cgtggccggg atggccatgg gccgcaacgt gttccaggcc 720

gagcagcccg gcctgatggc cgccgccgtg gcacggctgg tgcacgagcc acggcacgtg 780

ccggaccggt acgacgtcga cgaccggctc gcccttacgt cctga 825

<210> 44
<211> 367
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 44

Val Lys Leu Cys Trp Leu Asp Ile Arg Asn Val Asn Gly Ala Lys Glu
1 5 10 15

Ala Ile Val Glu Glu Ala Val His Gln Arg Val Asp Ala Val Val Ala
20 25 30

Ala Asp Pro Ala Asp Leu Glu Thr Leu Pro Pro Thr Val Lys Lys Val
35 40 45

Leu Phe Pro Gln Gly Gly Pro Leu Pro Glu Lys Leu Glu Pro Ala Asp
50 55 60

Leu Val Ile Val Glu Pro Ala Arg His Gly Glu Pro Ala Glu Leu Ala
65 70 75 80

Ala Arg Tyr Pro Glu Val Glu Phe Gly Arg Phe Val Glu Ile Val Asp
85 90 95

Ala Asp Ser Leu Glu Asp Ala Cys Arg Ser Ala Arg His Asp Arg Trp
100 105 110

```
Ser Leu Leu Tyr Phe Arg Asp Pro Thr Lys Ile Pro Leu Glu Ile Val
        115                 120                 125

Leu Ala Ala Ala Ala Gly Ala Glu Gly Ser Ile Ile Thr Gln Val Ala
    130                 135                 140

Asp Val Glu Glu Ala Glu Ile Val Phe Gly Val Leu Glu His Gly Ser
145                 150                 155                 160

Asp Gly Val Met Leu Ala Pro Arg Ala Val Gly Glu Ala Thr Glu Leu
                165                 170                 175

Arg Thr Ala Ala Val Ser Thr Ala Ala Asp Leu Ser Leu Val Glu Leu
            180                 185                 190

Glu Val Thr Gly Ile Arg Arg Val Gly Met Gly Glu Arg Ala Cys Val
        195                 200                 205

Asp Thr Cys Thr Asn Phe Arg Leu Asp Glu Gly Ile Leu Val Gly Ser
    210                 215                 220

His Ser Thr Gly Met Ile Leu Cys Cys Ser Glu Thr His Pro Leu Pro
225                 230                 235                 240

Tyr Met Pro Thr Arg Pro Phe Arg Val Asn Ala Gly Ala Leu His Ser
                245                 250                 255

Tyr Thr Leu Ser Ala Gly Gly Arg Thr Asn Tyr Leu Ser Glu Leu Val
            260                 265                 270

Ser Gly Gly Arg Val Leu Ala Val Asp Ser Gln Gly Lys Ser Arg Val
        275                 280                 285

Val Thr Val Gly Arg Val Lys Ile Glu Thr Arg Pro Leu Leu Ala Ile
    290                 295                 300

Asp Ala Val Ser Pro Ser Gly Thr Arg Val Asn Leu Ile Val Gln Asp
305                 310                 315                 320

Asp Trp His Val Arg Val Leu Gly Pro Gly Gly Thr Val Leu Asn Val
                325                 330                 335

Thr Glu Leu Thr Ala Gly Thr Lys Val Leu Gly Tyr Leu Pro Val Glu
            340                 345                 350

Lys Arg His Val Gly Tyr Pro Ile Asp Glu Phe Cys Ile Glu Lys
        355                 360                 365
```

<210> 45
<211> 1104
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 45
gtgaagctgt gctggctgga catccgtaac gtcaacggcg ccaaggaggc aatcgtcgag 60

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gaggcggtcc accagcgggt ggacgccgtc gtggcggccg atccggccga cctggagacg    120

cttcccccga cggtgaagaa ggtgctgttc ccgcagggcg ggccgctgcc ggagaagctg    180

gaaccggccg acctggtgat cgtcgagccg gcccggcacg gcgagcccgc cgagctggcg    240

gcccggtacc cggaggtgga gttcggccgg ttcgtcgaga tcgtcgacgc ggacagcctg    300

gaggacgcct gccggtccgc gcgccacgac cggtggagcc tgctgtactt ccgcgacccc    360

accaagatcc cgctggagat cgtgctggcg gccgcggcgg gcgcggaggg cagcatcatc    420

acccaggtcg ccgacgtcga ggaggcggag atcgtcttcg gcgtcctgga gcacggctcg    480

gacggagtga tgctggcgcc ccgcgccgtg ggggaggcca ccgagctgcg gaccgccgcg    540

gtgagcacgg cggcggacct gtcgctcgtg gagctggagg tcaccggcat ccggcgggtg    600

ggcatgggcg agcgcgcctg cgtcgacacg tgcacgaact tccgtctgga cgagggcatc    660

ctggtcggct cgcactccac cggcatgatc ctgtgctgca gcgagacgca tccgctgccg    720

tacatgccga cccggccgtt ccgggtcaac gccggcgcgc tgcactcgta cacgctctcc    780

gccggcgggc ggaccaacta cctcagcgag ctggtctccg gcggccgggt gctcgccgtg    840

gactcgcagg ggaagtcccg cgtcgtcaca gtgggacggg tcaagatcga gacgcgtccg    900

ctgctggcga tcgacgcggt ctccccctcc gggacacgcg tcaacctcat cgtccaggac    960

gactggcacg tgcgcgtgct cgggccgggc ggcaccgtgc tcaacgtgac cgagctgacc   1020

gccggcacga aggtgctcgg ttacctgccg gtggagaagc ggcacgtcgg ctacccgatc   1080

gacgagttct gcatcgagaa gtga                                          1104
```

<210> 46
<211> 253
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 46

```
Met Thr Ala Gln Pro Val Leu Asp Phe His Val Arg Leu Ala Pro Arg
1               5                  10                  15

Pro Gly Ala Arg Glu Arg Leu Leu Ala Ala Leu Arg Glu Cys Gly Leu
            20                  25                  30

Ala Arg Ala Val Val Cys Ala Gly Gly Thr Ile Asp Leu Asp Arg Leu
        35                  40                  45

Ser Arg Gln Leu Val Thr Gly Gly His Val Glu Thr Asp Ala Asp Asn
    50                  55                  60

Asp Ala Val Ala Ala Ala Cys Ala Gly Thr Asp Gly Arg Leu Val Pro
```

65 70 75 80

Phe Phe Phe Ala Asn Pro His Arg Pro Ala Glu Ala Tyr Arg Ala Arg
85 90 95

Ala Ala Glu Phe Arg Gly Leu Glu Ile Ser Pro Ala Val His Gly Val
100 105 110

Ala Leu Thr Asp Pro Arg Val Ala Asp Leu Val Ala Val Ala Ala Glu
115 120 125

Phe Asp His Pro Val Tyr Val Val Cys Leu Asp Arg Pro Gly Ala Gly
130 135 140

Val Ala Asp Leu Val Gly Leu Ser Arg Arg Phe Pro Gln Val Ser Phe
145 150 155 160

Val Leu Gly His Ser Gly Val Gly Asn Ile Asp Leu Tyr Ala Leu Thr
165 170 175

Leu Ile Gln Asp Glu Pro Asn Ile Ser Leu Glu Thr Ser Gly Gly Tyr
180 185 190

Thr Cys Val Ala Glu Ala Ala Leu Arg Arg Leu Gly Asp Asp Arg Val
195 200 205

Val Phe Gly Ser Glu Tyr Pro Leu Gln His Pro Ala Val Glu Leu Ala
210 215 220

Lys Phe Gln Ala Leu Arg Leu Pro Pro Glu Arg Trp Arg Arg Ile Ala
225 230 235 240

Trp Asp Asn Ala His Arg Leu Leu Gly Glu Glu Lys Arg
245 250

<210> 47
<211> 762
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 47
atgaccgcgc agccggtgct ggacttccac gtacgcctgg cgccccggcc cggggcgcgg 60

gagcggctgc tcgccgcgct gcgcgagtgc gggctggcgc gggcggtggt gtgcgcgggc 120

ggcaccatcg acctggaccg gctgtcccgc cagctcgtca ccggcggcca cgtcgagacc 180

gacgccgaca acgacgcggt ggcggcggcc tgcgccggca ccgacggccg gctggtgccg 240

ttcttcttcg ccaacccgca ccggccggcc gaggcgtacc gggcccgcgc cgccgagttc 300

cgcggcctgg agatctcacc cgccgtccac ggcgtcgccc tgaccgaccc gcgggtcgcc 360

gacctcgtgg ccgtggcggc ggagttcgac catccggtgt acgtggtctg cctggaccga 420

cccggcgcgg gcgtggccga cctggtcggc ctgagccgcc ggttcccgca ggtgagcttc 480

gtgctcgggc acagcggcgt cggcaacatc gacctctacg ccctgaccct gatccaggac 540

gagccgaaca tctcgctgga gacctccggc ggctacacct gcgtggccga ggcggcgcta 600

cgccgcctcg gcgacgaccg ggtggtgttc ggctccgagt acccgctgca gcacccggcc 660

gtggaactgg ccaagttcca ggcgttgcga ctgccgccgg agcggtggcg gcggatcgcc 720

tgggacaacg cgcatcgact gctaggagag gagaagcggt ga 762

<210> 48
<211> 438
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 48

Val Ser Glu Pro Ser Ser Ser Leu Pro Arg Leu Gly Gln Trp His Gly
1 5 10 15

Leu Glu Asp Leu Arg Arg Leu Gln Glu Lys Gln Leu Ala Glu Thr Phe
20 25 30

Thr Trp Ala Ala Arg Ser Pro Phe Tyr Arg Ala Arg Leu Ala Ser Gly
35 40 45

Ala Pro Pro Val Thr Pro Ala Asp Leu Ala Asp Leu Pro Leu Thr Thr
50 55 60

Lys Gln Asp Leu Arg Asp Asn Tyr Pro Phe Gly Met Leu Ala Val Pro
65 70 75 80

Arg Glu Arg Leu Ala Thr Tyr His Glu Ser Ser Gly Thr Ala Gly Lys
85 90 95

Pro Thr Pro Ser Tyr Tyr Thr Ala Glu Asp Trp Thr Asp Leu Ala Glu
100 105 110

Arg Phe Ala Arg Lys Trp Ile Gly Met Ser Ala Asp Asp Val Phe Leu
115 120 125

Val Arg Thr Pro Tyr Ala Leu Leu Leu Thr Gly His Leu Ala His Ala
130 135 140

Ala Ala Arg Leu Arg Gly Ala Thr Val Val Pro Gly Asp Asn Arg Ser
145 150 155 160

Leu Ala Met Pro Tyr Ala Arg Val Val Arg Val Met His Asp Leu Asp
165 170 175

Val Thr Leu Thr Trp Ser Val Pro Thr Glu Cys Leu Ile Trp Ala Ala
180 185 190

Ala Ala Ile Ala Ala Gly His Arg Pro Asp Ile Asp Phe Pro Ala Leu
195 200 205

```
Arg Ala Leu Phe Val Gly Gly Glu Pro Met Thr Asp Ala Arg Arg Arg
    210                 215                 220

Arg Ile Ser Arg Leu Trp Gly Val Pro Val Ile Glu Glu Tyr Gly Ser
225                 230                 235                 240

Thr Glu Thr Gly Ser Leu Ala Gly Glu Cys Pro Glu Gly Arg Leu His
                245                 250                 255

Leu Trp Ala Asp Arg Ala Leu Phe Glu Val Tyr Asp Pro Asp Thr Gly
            260                 265                 270

Ala Val Arg Ala Asp Gly Asp Gly Gln Leu Val Val Thr Pro Leu Phe
        275                 280                 285

Arg Glu Ala Met Pro Leu Leu Arg Tyr Asn Leu Glu Asp Asn Val Ser
    290                 295                 300

Val Ser Tyr Asp Asp Cys Gly Cys Gly Trp Lys Leu Pro Thr Val Arg
305                 310                 315                 320

Val Leu Gly Arg Ser Ala Phe Gly Tyr Arg Val Gly Gly Thr Thr Ile
                325                 330                 335

Thr Gln His Gln Leu Glu Glu Leu Val Phe Ser Leu Pro Glu Ala His
            340                 345                 350

Arg Val Met Phe Trp Arg Ala Lys Ala Glu Pro Ala Leu Leu Arg Val
        355                 360                 365

Glu Ile Glu Val Ala Ala Ala His Arg Val Ala Ala Glu Ala Glu Leu
    370                 375                 380

Thr Ala Ala Ile Arg Ala Ala Phe Gly Val Asp Ser Glu Val Thr Gly
385                 390                 395                 400

Leu Ala Pro Gly Thr Leu Ile Pro Leu Asp Ala Leu Thr Ser Met Pro
                405                 410                 415

Asp Val Val Lys Pro Arg Ser Leu Phe Gly Pro Asp Glu Asp Trp Ser
            420                 425                 430

Lys Ala Leu Leu Tyr Tyr
        435
```

<210> 49
<211> 1317
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 49
gtgagcgagc caagttcgag cctgccccgg ctcggccagt ggcacggcct cgaggacctg 60

cggcgcctcc aggagaagca actggcggag acgttcacct gggcggcccg gtcgccgttc 120

taccgggcgc ggctggcctc cggcgcgccg ccggtgacgc ccgccgacct ggccgacctg 180

```
ccgctgacca ccaagcagga cctgcgggac aactaccccct tcggcatgct cgccgtgccc    240

cgcgaacggc tggcgaccta ccacgagtcg agcgggaccg ccgggaagcc caccccctcc    300

tactacaccg cggaggactg gaccgacctg gcggagcgct tcgcccgcaa gtggatcggc    360

atgtccgccg acgacgtctt cctggtccgc acgccgtacg cgctgctgct gaccgggcat    420

ctcgcccacg ccgcagcccg gctgcgtggg gccacggtgg tacctggcga caaccggtcg    480

ctggcgatgc cgtacgcccg ggtggtccgg gtgatgcacg acctggacgt cacgctcacc    540

tggtcggtgc cgacggagtg cctgatctgg gccgccgcgg cgatcgcggc cgggcaccgg    600

cccgacatcg acttcccggc gctgcgcgcg ctgttcgtcg gcggcgagcc gatgaccgac    660

gcccgccggc ggcggatcag ccgcctgtgg ggggtgccgg tcatcgagga gtacggctcg    720

acggagaccg gcagcctggc cggggagtgc cccgagggac gcctgcacct gtgggccgac    780

cgggcgctgt tcgaggtgta cgacccggac accggcgccg tccgcgcgga cggcgacggc    840

cagctcgtgg tcacgccgct gttccgggag gcgatgccgc tgctgcggta caacctggag    900

gacaacgtgt cggtctccta cgacgactgc ggatgcggct ggaagctgcc caccgtgcgg    960

gtgctcggcc ggtcggcgtt cggctaccgg gtcggcggca ccaccatcac ccagcaccag   1020

ctggaggaac tggtcttctc cctgccggag gcgcaccggg tgatgttctg gcgggccaag   1080

gcggagccgg cgctgttgcg ggtcgagatc gaggtggccg ccgcgcaccg ggtcgccgcc   1140

gaggcggagc tgaccgccgc gatccgggcc gccttcggcg tggacagcga ggtcaccggc   1200

ctggcgccgg gaaccctgat cccgctcgac gcgctgacca gcatgccgga cgtggtgaag   1260

ccacgcagcc tgttcggtcc ggacgaggac tggagcaaag cgctcctcta ctactga      1317
```

<210> 50
<211> 396
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 50

```
Met Pro Gln Met Arg Val Ala Val Ala Gly Ala Gly Ile Ala Gly Leu
1               5                  10                  15

Ala Phe Ala Ala Ala Leu Arg Arg Thr Gly Ile Asp Cys His Val Tyr
            20                  25                  30

Glu Gln Ala Asp Gln Leu Met Glu Val Gly Ala Gly Val Gln Val Ala
        35                  40                  45

Pro Asn Ala Thr Arg Leu Leu His Arg Leu Gly Leu Arg Asp Arg Leu
    50                  55                  60
```

```
Arg Thr Val Ala Val Ala Pro Gln Ala Ile Glu Met Arg Arg Trp Asp
65                  70                  75                  80

Asp Gly Thr Leu Leu Gln Arg Thr Gln Leu Gly Ser Val Cys Gly Arg
                85                  90                  95

Arg Phe Gly Ala Pro Tyr Tyr Val Val His Arg Ala Asp Leu His Ser
            100                 105                 110

Ser Leu Leu Ser Leu Val Pro Pro Asp Arg Val His Leu Gly Ala Arg
        115                 120                 125

Leu Thr Ala Val Thr Gln Thr Ala Asp Glu Ala Tyr Leu His Leu Ser
    130                 135                 140

Asn Gly Thr Thr Val Ala Ala Asp Leu Val Val Gly Ala Asp Gly Ile
145                 150                 155                 160

His Ser Val Ala Arg Glu Gln Ile Val Ala Asp Arg Pro Arg Phe Ser
                165                 170                 175

Gly Gln Ser Ile Tyr Arg Gly Leu Val Pro Ala Glu Arg Val Pro Phe
            180                 185                 190

Leu Leu Thr Glu Pro Arg Val Gln Leu Trp Phe Gly Pro Asp Gln His
        195                 200                 205

Cys Val Cys Tyr Pro Val Ser Ala Gly Arg Gln Val Ser Phe Gly Ala
    210                 215                 220

Thr Val Pro Ala Thr Asp Trp Arg Gln Glu Ser Trp Ser Gly Arg Gly
225                 230                 235                 240

Asp Val Thr Gln Leu Ala Ala Ala Tyr Ala Gly Trp His Pro Asp Val
                245                 250                 255

Thr Arg Leu Ile Ala Ala Ala Asp Arg Val Gly Arg Trp Ala Leu His
            260                 265                 270

Asp Arg Asp Ser Ile Asp Arg Leu Ser Ala Gly Arg Val Thr Leu Ile
        275                 280                 285

Gly Asp Ala Ala His Pro Met Leu Pro Phe Gln Ala Gln Gly Ala Asn
    290                 295                 300

Gln Ala Val Glu Asp Ala Val Val Leu Ala Val Cys Leu Ala Gly Val
305                 310                 315                 320

Glu Pro Ala Gly Leu Gly Ala Ala Leu Arg Arg Tyr Glu Arg Ile Arg
                325                 330                 335

Leu Pro Arg Thr Thr Arg Ile Gln Arg Gln Ser Arg Ala Asn Ala Glu
            340                 345                 350

Met Phe His Leu Ala Asp Gly Ala Asp Gln Arg Arg Arg Asp Val Ala
        355                 360                 365
```

Ala Gln Ser Ser Ser Gly Leu Asp Arg His Glu Trp Leu Phe Gly Tyr
370 375 380

Asp Ala Glu Lys Ala Thr Thr Thr Ser Gly Ser Ala
385 390 395

<210> 51
<211> 1191
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 51
atgccgcaga tgagggtcgc cgtggccggc gccggcatcg ccgggctcgc cttcgccgcc 60

gccctgcgcc ggaccgggat cgactgccac gtgtacgaac aggccgacca gctcatggag 120

gtgggcgcgg gcgtgcaggt cgcgccgaac gccacccggc tgctgcaccg gctgggcctg 180

cgtgaccgcc tgcgtacggt ggctgtcgcg ccgcaggcga tcgagatgcg ccgctgggac 240

gacggcacgc tgctgcaacg cacccagctg ggcagcgtgt gcggacgccg cttcggcgcg 300

ccgtactacg tggtgcaccg cgcggacctg cacagcagcc tgctgtcgct ggtgccgccg 360

gaccgggtgc acctgggcgc ccgcctcacc gccgtgacgc agaccgccga cgaggcgtac 420

ctgcacctgt ccaacggcac cacggtcgcg gcggatctcg tcgtgggcgc cgacggcatc 480

cactcggtcg cgcgggagca gatcgtggcg gaccggccgc gcttctccgg acagtccatc 540

taccgcgggc tggtgccggc cgagcgggtg ccgttcctgc tcaccgaacc ccgggtgcag 600

ttgtggttcg ggccggacca gcactgcgtc tgctacccgg tgtccgccgg ccggcaggtg 660

agcttcggcg cgacggtgcc cgccaccgac tggcggcagg agtcgtggtc gggccggggc 720

gacgtgacgc aactcgcggc cgcgtacgcg ggctggcacc cggacgtcac ccggctgatc 780

gccgcggccg accgggtcgg caggtgggcg ctgcacgacc gggacagcat cgaccggctc 840

agcgcgggac gggtgaccct gatcggcgac gccgcgcacc cgatgctgcc gttccaggcg 900

cagggcgcga accaggccgt cgaggacgcg gtggtgctcg cggtctgcct ggccggcgtg 960

gaaccggcgg gcctgggcgc cgcgctgcgc cgctacgaac ggatccgcct gccccggacc 1020

acccggatcc agcggcagtc ccgggccaac gccgagatgt tccacctggc cgacggcgcc 1080

gaccagcgcc gccgggacgt cgccgcacaa tcctcgtccg gcctggaccg ccacgaatgg 1140

ctcttcgggt acgacgccga gaaagccacc acgaccagcg ggagcgcctg a 1191

<210> 52
<211> 261
<212> PRT

<213> Micromonospora sp. strain 046-ECO11

<400> 52

```
Met Glu Leu Thr Gly Ile Glu Ser Lys Val Ala Leu Val Thr Gly Ala
1               5                  10                  15

Gly Gln Gly Ile Gly Ala Ala Val Ala Gly Val Leu Ala Arg Ala Gly
            20                  25                  30

Ala Gln Val Ala Ala Val Asp Arg Asn Ala Glu Ala Leu Thr Thr Val
        35                  40                  45

Val Thr Lys Leu Ala Ala Glu Gly Asp Ser Ala Arg Ala Tyr Cys Val
    50                  55                  60

Asp Val Cys Asp Ser Glu Ala Val Asp Ala Leu Val Arg Arg Val Glu
65                  70                  75                  80

Asp Glu Met Gly Pro Val Ala Ile Leu Val Asn Ala Ala Gly Val Leu
                85                  90                  95

His Thr Gly Arg Val Val Glu Leu Ser Asp Arg Gln Trp Arg Arg Thr
            100                 105                 110

Phe Ser Val Asn Ala Asp Gly Val Phe His Val Ser Arg Ala Val Ala
        115                 120                 125

Arg Arg Met Val Gly Arg Arg Arg Gly Ala Ile Val Thr Val Ala Ser
    130                 135                 140

Asn Ala Ala Gly Val Pro Arg Thr Glu Met Ala Ala Tyr Ala Ala Ser
145                 150                 155                 160

Lys Ala Ala Ser Ala Gln Phe Thr Arg Cys Leu Gly Leu Glu Leu Ser
                165                 170                 175

Gly Tyr Gly Ile Arg Cys Asn Val Val Ser Pro Gly Ser Thr Asp Thr
            180                 185                 190

Pro Met Leu Arg Ala Met Leu Gly Glu Gly Ala Asp Pro Ser Ala Val
        195                 200                 205

Ile Glu Gly Thr Pro Gly Ala Tyr Arg Val Gly Ile Pro Leu Arg Lys
    210                 215                 220

Leu Ala Gln Pro Arg Asp Val Ala Glu Ala Val Ala Tyr Leu Val Ser
225                 230                 235                 240

Asp Gln Ala Gly His Val Thr Met His Asp Leu Tyr Val Asp Gly Gly
                245                 250                 255

Ala Ala Leu His Val
            260
```

<210> 53
<211> 786

<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 53
atggaactga ccggaatcga gtcgaaggtc gccctggtca cgggcgcggg gcagggcatc 60

ggcgccgccg tggccggtgt cctggcgagg gcgggcgcgc aggtggcggc ggtggaccgc 120

aacgccgagg cgctgaccac cgtcgtgacg aagctcgccg ccgagggcga ctcggcgcgc 180

gcctactgcg tcgacgtgtg cgacagcgag gcggtggacg cgctggtgcg ccgggtcgag 240

gacgagatgg ggccggtcgc catcctggtc aacgccgccg gcgtgctgca caccggacgg 300

gtcgtcgagc tgtcggaccg gcagtggcgc cggaccttct cggtgaacgc cgacggcgtg 360

ttccacgtgt cccgggcggt ggcgcggcgg atggtgggcc gccgtcgtgg cgcgatcgtc 420

accgtggcgt cgaacgccgc cggggtgccg cgtaccgaga tggccgcgta cgccgcctcc 480

aaggccgcgt ccgcgcagtt cacccgctgc ctggggcttg agctgtccgg ctacggcatc 540

cggtgcaacg tggtctcgcc cggctccacc gacaccccca tgctgcgggc catgctcggc 600

gagggcgccg acccgagcgc ggtgatcgag ggcacgccgg gcgcgtaccg cgtcggcatc 660

ccgctgcgca agctggccca gccgcgcgac gtggccgagg cggtcgccta tctggtgtcc 720

gaccaggcgg gccacgtgac catgcacgac ctgtacgtcg acggcggcgc ggccctgcac 780

gtgtga 786

<210> 54
<211> 224
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 54

Met Ala Met Thr Pro Ile Ala Pro Tyr Arg Met Pro Gly Asp Gly Asp
1 5 10 15

Leu Pro Gly Thr Ala Leu Pro Trp Arg Pro His Pro Asp Arg Ala Ala
20 25 30

Val Leu Val His Asp Leu Gln Arg Tyr Phe Leu Arg Pro Phe Glu Ala
35 40 45

Gly Glu Ser Pro Met Ala Glu Leu Leu Pro Asn Val Ala Lys Leu Leu
50 55 60

Ala Thr Ala Arg Ala Ala Gly Val Pro Val Leu Tyr Thr Ala Gln Pro
65 70 75 80

Gly Gly Met Ser Arg Gln Asp Arg Gly Leu Leu His Asp Leu Trp Gly
85 90 95

```
Pro Gly Met Ser Ser Ala Glu Asp Asp Arg Gly Ile Val Asp Asp Val
            100                 105                 110

Ala Pro Gln Pro Gly Asp Thr Val Leu Thr Lys Trp Arg Tyr Ser Ala
        115                 120                 125

Phe Phe Arg Ser Asp Leu Glu Glu Arg Leu Arg Gly Ala Gly Arg Asp
    130                 135                 140

Gln Leu Val Val Cys Gly Val Tyr Ala His Met Gly Cys Leu Ile Thr
145                 150                 155                 160

Ala Cys Asp Ala Phe Ser Arg Asp Ile Glu Ala Phe Leu Val Ala Asp
                165                 170                 175

Ala Leu Ala Asp Leu Ser Arg Glu Asp His Leu Met Ala Leu Arg Tyr
            180                 185                 190

Ala Ala Asp Arg Cys Ala Val Pro Leu Trp Thr Ala Asp Val Leu Asp
        195                 200                 205

Gly Leu Ala Asp Ala Ala Gly Arg Pro Asp Gln Ser Ser Thr Gln Arg
    210                 215                 220
```

<210> 55
<211> 675
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 55
atggccatga ccccgatcgc gccgtaccgc atgcccggcg acggcgacct gcccggcacc 60

gcgctgccct ggcgtccgca cccggaccgg gccgccgtgc tggtgcacga cctgcaacgc 120

tacttcctgc gcccgttcga ggccggggag tccccgatgg ccgaactgct ccccaacgtc 180

gcgaagctgc tcgccacggc gcgggcggcc ggcgtgccgg tgctgtacac cgcgcagccc 240

ggcggcatga gccggcagga ccgcgggttg ctgcacgacc tgtggggccc cggcatgagc 300

agcgccgagg acgaccgggg catcgtcgac gacgtcgccc cgcagccggg cgacacggtg 360

ctgaccaagt ggcgctacag cgcgttcttc cgcagcgacc tggaggagcg actgcgcggt 420

gcgggacggg accagctcgt ggtctgcggc gtgtacgcgc acatggggtg cctgatcacc 480

gcctgcgacg cgttcagccg cgacatcgag gcgttcctgg tggcggacgc gctggccgac 540

ctatcgcgcg aggaccacct gatggcgctg cgctacgccg cggaccgctg cgcggtgccg 600

ttgtggacgg cggatgtgct ggacgggctg gcggacgccg ccgggcgtcc ggatcagagc 660

agcacccaac gatga 675

<210> 56

<211> 233
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 56

Met Ser Asp Arg Thr Arg Val Val Val Val Gly Gly Thr Ser Gly Ile
1 5 10 15

Gly Arg His Phe Ala Arg Phe Cys Ala Glu Arg Gly Asp Asp Val Val
20 25 30

Ile Thr Gly Arg Ser Ala Ala Arg Thr Lys Thr Val Ala Asp Glu Ile
35 40 45

Gly Gly Arg Thr Arg Gly Leu Ala Leu Asp Leu Ala Glu Pro Glu Thr
50 55 60

Ile Ala Asp Ala Leu Ala Asp Val Pro His Val Asp Arg Leu Val Val
65 70 75 80

Ala Ala Leu Asp Arg Asp Tyr Asn Thr Val Arg Ala Tyr Arg Pro Gly
85 90 95

Asp Ala Ala Arg Leu Leu Thr Val Lys Leu Val Gly Tyr Thr Ala Val
100 105 110

Leu His Ala Leu Ala Pro Arg Met Thr Asp Glu Ser Ala Val Val Leu
115 120 125

Leu Gly Gly Leu Ala Ser His Arg Pro Tyr Pro Gly Ser Thr Ser Val
130 135 140

Thr Thr Ala Asn Gly Gly Ile Ser Ala Leu Val Arg Thr Leu Ala Val
145 150 155 160

Glu Leu Ser Pro Val Arg Val Asn Ala Leu His Pro Ser Ile Val Ser
165 170 175

Asp Thr Pro Phe Trp Ser Asp Lys Pro Ala Ala Arg Glu Ala Ala Ala
180 185 190

Thr Arg Ala Leu Ser Arg Arg Pro Val Thr Met Gln Asp Cys Ala Glu
195 200 205

Ala Ile Asp Phe Leu Leu Thr Asn Arg Ser Ile Asn Gly Val Asn Leu
210 215 220

Asn Ile Asp Gly Gly Asp Val Leu Ile
225 230

<210> 57
<211> 702
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 57

atgtcggatc ggacccgggt cgtggtcgtc ggcggaacct cggggatcgg gcggcacttc 60

gcccgattct gcgccgaacg cggagacgac gtggtgatca ccggccgttc ggcggcccgg 120

accaagaccg tggcggacga gatcggcggg cggacccgtg ggctcgctct cgacctggcc 180

gagccggaga cgatcgcgga cgcgctcgcc gacgtgccgc acgtcgaccg gctcgtggtc 240

gcggcgctgg accgcgacta caacaccgtc cgcgcgtacc ggccgggcga cgcggcgcgg 300

ctgctgaccg tcaagctggt cggctacacg gcggtcctgc acgccctcgc cccgcggatg 360

accgacgaga gcgcagtcgt gctgctcggc ggcctggcca gccaccggcc gtatcccggc 420

tccacctccg tcacgaccgc caacggcggg atcagcgcgc tggtgcggac cctggctgtg 480

gaactctcgc cggtccgggt caacgccctg cacccgagca tcgtctccga cacgccgttc 540

tggagcgaca agcccgccgc gcgggaggcc gccgcgaccc gcgcgctcag ccgacggccg 600

gtcaccatgc aggactgcgc cgaggcgatc gacttcctgc tgacgaaccg ctcgataaac 660

ggggtcaacc tgaacatcga cggcggggac gtgctcatct ga 702

<210> 58
<211> 246
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 58

Met Thr Ser Ala Leu Arg Thr Ser Ala Trp Thr Tyr Asp Asp Phe Thr
1 5 10 15

Ser Arg Glu Leu Asp Pro Ala Arg Trp Ala Ile Met Ser Ile Ala Gly
20 25 30

Ala Asp Gly Gln Thr His Arg Tyr Gln Asp Arg Asn Ala Gln Val Arg
35 40 45

Thr Gly Asp Gly Arg Leu Glu Leu Thr Val Asp Pro Phe Thr Arg Phe
50 55 60

His Asp Thr Asp Pro Arg Gln Asn Asn Ala Lys Gln Met Tyr Arg Ser
65 70 75 80

Val Arg Arg Phe Ala Val Pro Ala Glu Gly Ser Leu Thr Val Glu Val
85 90 95

Glu Met Gly Val Arg Thr Tyr Arg Gln Ile Pro His Asp Leu Leu Asp
100 105 110

Ala Phe Gly Thr Val Asn Leu Phe Asp Leu Glu Thr Gly Val Val Phe
115 120 125

Asn Ala Ala Ala Thr Asn Asp Thr Val Tyr Ala Thr Val Glu Arg Leu

130 135 140

Val Leu Pro Gly Val Thr Gln Pro His Glu His Tyr Ile His Arg Val
145 150 155 160

Val Leu Asp Val Pro Thr Glu Pro Gly Arg Ala His Gly Tyr Ala Ile
165 170 175

Thr Tyr Arg Ala Pro Thr Ser Glu Val Glu Phe His Val Asp Gly Arg
180 185 190

Leu Ala Tyr Trp Ala Arg Val Pro Val Pro Val Thr Gly Phe His Ala
195 200 205

Gly Met Ala Leu Phe Ser Ala Arg Asp Leu Ala Arg Tyr Pro Arg Glu
210 215 220

Gln Arg Glu His Gly Gln Gly Ala Thr Gly Trp Trp Gly Pro Trp Arg
225 230 235 240

Ile Ala Ser Gly Val Arg
245

<210> 59
<211> 741
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 59
atgacgtcgg cactgagaac cagcgcgtgg acgtacgacg acttcaccag ccgcgagctg 60

gaccccgccc gctgggcgat catgtcgatc gccggcgcgg acgggcagac ccacaggtac 120

caggaccgca acgcccaggt ccgcaccggc gacgggcggc tggagctgac cgtcgacccg 180

ttcacccgct tccacgacac cgatccccgg cagaacaacg ccaagcagat gtaccggtcg 240

gtgcggcgct tcgccgtgcc ggcggagggc tcgctgaccg tcgaggtgga gatgggcgtg 300

cggacgtacc ggcagatccc gcacgacctg ctggacgcgt tcggcacggt gaacctgttc 360

gacctggaga ccggcgtcgt gttcaacgcc gccgccacga acgacaccgt gtacgcgacg 420

gtcgagcgcc tggtgctgcc cggcgtgacc cagccgcacg agcactacat ccaccgggtg 480

gtcctggacg tgccgacgga gccgggccgg gcgcacggat acgccatcac ctaccgggcg 540

ccgacgtcgg aggtggagtt ccacgtcgac ggccggctcg cctactgggc gcgggtcccg 600

gtgccggtga ccggattcca cgccggcatg gcgctcttct ccgcccgcga cctggcccgg 660

taccccgcg agcagcggga gcacgggcag ggcgcgaccg ggtggtgggg gccgtggcgg 720

atcgcctccg gcgtcagatg a 741

<210> 60

<211> 111
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 60

Met Asp Thr Ala Ala Pro Ala Thr Asp Gly Gly Arg Tyr Leu Ala Val
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His His Ser Ala Glu Phe Arg Glu Leu Arg Arg Arg Ser Ser Thr Phe
20 25 30

Thr Leu Trp Ala Ser Val Ala Phe Phe Gly Trp Trp Phe Leu Gly Ser
35 40 45

Leu Leu Ala Thr Tyr Ala Pro Asp Phe Phe Arg Glu Lys Val Ala Gly
50 55 60

Pro Val Asn Val Gly Leu Leu Phe Val Phe Leu Ser Phe Ala Phe Val
65 70 75 80

Val Thr Leu Ala Ala Phe Tyr Leu Arg Tyr Ala Arg Thr His Leu Asp
85 90 95

Pro Leu Ser Glu Lys Ile Arg Ala Asp Leu Glu Gly Ala Ser Arg
100 105 110

<210> 61
<211> 336
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 61
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ttcggctggt ggttcctcgg cagcctgctc gccacctacg cgccggactt cttccgggag 180

aaggtggccg gcccggtcaa cgtgggtctg ctcttcgtct tcctgtcgtt cgccttcgtg 240

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aagatccgtg ccgacctgga aggagcgtcc cgatga 336

<210> 62
<211> 559
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 62

Met Ser Val Ile Leu Ala Asp Pro Pro Pro Pro Val Asp Asn Thr Trp
1 5 10 15

Ala Thr Pro Ala Ile Ala Val Pro Val Thr Ile Val Leu Ala Leu Ala

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Val Leu Tyr Leu Val Arg Ser Ala Arg Ala Ser Thr Thr Thr Ala Asp
        35                  40                  45

Gly Phe Leu Leu Ala Asp Arg Arg Ile Gly Pro Val Gln Asn Ala Leu
    50                  55                  60

Ala Val Ala Ser Ala Pro Leu Met Tyr Ser Thr Met Tyr Ile Ile Thr
65                  70                  75                  80

Gly His Ile Ala Leu Ser Gly Tyr Asp Ala Ile Leu Leu Met Thr Ala
                85                  90                  95

Phe Thr Met Gly Thr Met Leu Ala Leu Phe Leu Phe Ala Gly Pro Val
            100                 105                 110

Arg Asn Val Gly Gly Tyr Thr Leu Gly Asp Leu Leu Ala Val Arg Thr
        115                 120                 125

Arg Glu Arg Pro Ala Arg Ile Ala Ser Ala Val Leu Thr Leu Leu Thr
    130                 135                 140

Tyr Val Met Leu Thr Val Ile Met Met Ala Ala Ile Ala Phe Ile Phe
145                 150                 155                 160

Asn Arg Trp Phe Gly Val Asp Ala Leu Val Gly Leu Val Leu Pro Val
                165                 170                 175

Phe Val Val Gly Leu Ile Thr Val Gly Tyr Val Tyr Leu Gly Gly Met
            180                 185                 190

Leu Gly Val Thr Arg Ile Leu Val Phe Lys Leu Val Leu Ser Val Val
        195                 200                 205

Val Val Gly Val Leu Thr Ala Trp Val Leu Ala Arg Phe Asp Leu Asn
    210                 215                 220

Leu Phe Ser Leu Leu Glu Arg Ala Glu Ala Asn Ala Ala Pro Val Pro
225                 230                 235                 240

Ser Gly Ser Asp Leu Leu Gly Pro Gly Arg Leu Phe Gly Glu Gly Ala
                245                 250                 255

Thr Thr Leu Val His Leu Ser Lys Leu Phe Ala Ile Ala Val Gly Val
            260                 265                 270

Ala Ala Ile Pro Phe Leu Phe Met Arg Asn Phe Ala Val Thr Ser Gly
        275                 280                 285

Arg Asp Ala Arg Arg Ser Thr Gly Trp Ala Ser Met Ile Ile Val Gly
    290                 295                 300

Phe Tyr Leu Cys Leu Ser Val Val Gly Leu Gly Ala Val Ala Ile Leu
305                 310                 315                 320

Gly Arg Asp Asn Ile Gly Val Ile Lys Ala His Arg Asp Ile Ser Phe
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                325                 330                 335

Pro Lys Leu Ala Asp Glu Leu Gly Gly Pro Val Met Val Gly Ser Leu
            340                 345                 350

Ala Gly Val Ala Val Leu Thr Ile Val Gly Val Phe Ala Pro Leu Leu
        355                 360                 365

His Ser Ala Val Thr Thr Val Thr Lys Asp Leu Asn Val Ile Arg Gly
    370                 375                 380

Arg Arg Leu Asp Pro Ala Ala Glu Leu Arg Asp Ile Lys Arg Asn Thr
385                 390                 395                 400

Leu Ile Ile Gly Val Gly Ser Val Leu Leu Ala Val Val Met Leu Pro
                405                 410                 415

Val Arg Thr His Ile Phe Ile Pro Thr Ser Ile Asp Ile Ala Gly Ala
            420                 425                 430

Val Val Leu Pro Ile Val Val Tyr Ala Leu Phe Trp Arg Arg Phe Asn
        435                 440                 445

Thr Arg Gly Leu Gln Trp Thr Val Tyr Gly Gly Leu Ala Leu Thr Ala
    450                 455                 460

Phe Leu Val Leu Phe Ser Asn Gly Val Ser Gly Glu Pro Asp Ala Ile
465                 470                 475                 480

Phe Pro Asp Arg Asn Phe Lys Phe Val Asp Val Glu Pro Ala Leu Ile
                485                 490                 495

Thr Val Pro Val Gly Phe Leu Leu Gly Tyr Leu Gly Ser Ile Thr Ser
            500                 505                 510

Arg Glu Arg Asp Asp Ala Ala Phe Ala Glu Met Gln Val Arg Ser Leu
        515                 520                 525

Thr Gly Ala Val Val Thr Gly Pro Pro Arg Pro Ala Ala Val Asp Asp
    530                 535                 540

Glu Asp Arg Asp Gly Arg Gln Asp Arg Ala Pro Ser Pro Val Ser
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<210> 63
<211> 1680
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 63
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cgcgccagca ccaccaccgc ggacggcttc ctgctggccg accggcggat cgggccggtg 180

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<210> 64
<211> 5960
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 64
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cctcggcggg cctggacgac cgcaagaaga tgagcgcgga gatcttcagc gacaacatca   5340

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<210> 65
<211> 532
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 65

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Val Thr Ala Leu Ala Leu Ala Arg His Gly Val Ala Cys Val Leu Val
            20                  25                  30

Asp Gln Gly Phe Glu Thr Ser Val His Pro Lys Leu Asp Tyr Val Asn
        35                  40                  45

Ala Arg Ser Met Glu Phe Leu Arg Gln Phe Gly Leu Ala Asp Asp Val
    50                  55                  60

Arg Ala Ala Gly Val Ala Pro Glu His Arg Ala Asp Val Ile Trp Ser
65                  70                  75                  80

Thr Gly Leu Ala Gly Glu Pro Ile Thr Arg Trp Gly Leu Pro Ser Val
                85                  90                  95

Thr Gln Glu Trp Arg Arg Ile Ala Glu His Asn Asp Gly Thr Gln Pro
            100                 105                 110
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Ala Glu Pro Gly Gln Arg Ile Ser Gln Ile Asp Leu Glu Pro Val Leu
        115                 120                 125

Arg Ala Arg Cys Arg Arg Glu Pro Leu Val Asp Leu Arg Leu Gly Val
    130                 135                 140

Arg Phe Asp Ser Leu Thr Gln Asp Asp Ala Gly Val Thr Ser Val Leu
145                 150                 155                 160

Ala Asp Asp Thr Gly Gly Glu Val Arg Val Arg Ser Glu Tyr Val Val
                165                 170                 175

Gly Cys Asp Gly Ala Ser Ser Gln Val Arg Arg Ala Val Gly Ile Gly
            180                 185                 190

Glu Glu Gly Phe Asp Val Pro Gly Leu Pro Gly Ala Phe Met Val His
        195                 200                 205

Phe Thr Ser Arg Asp Leu Asp Ser Leu His Arg His Gly Arg Phe Trp
    210                 215                 220

His Tyr Phe Ala Phe Arg Tyr Val Ile Ile Ala Gln Asp Glu Val Asp
225                 230                 235                 240

Thr Trp Thr Ala His Val Asn Gly Val Asp Pro Asn Glu Phe Asp Glu
                245                 250                 255

Pro Pro Ala Asp Pro Glu Ala Phe Leu Leu Asp Thr Ile Arg Thr Glu
            260                 265                 270

Leu Arg Ile Asp Lys Val Leu Leu Thr Ser Arg Trp Arg Pro Gly Phe
        275                 280                 285

Met Leu Ala Asp Arg Tyr Arg Ala Gly Arg Val Leu Leu Ala Gly Asp
    290                 295                 300

Ser Ala His Arg Met Phe Pro Thr Gly Ala Tyr Gly Met Asn Thr Gly
305                 310                 315                 320

Ile Gly Asp Ala Val Asp Val Ala Trp Lys Leu Ala Ala Val Val Arg
                325                 330                 335

Gly Phe Gly Gly Pro Gly Leu Leu Asp Ser Tyr Asp Ala Glu Arg Arg
            340                 345                 350

Pro Val Gly Arg Arg Asn Met Arg Thr Ser His Arg His Leu Gly Val
        355                 360                 365

His Leu Arg Ala Gly Glu Leu Leu Arg Gly Gly Ala Pro Leu Pro Ser
    370                 375                 380

Val Ala Ala Phe Leu Asp Ala Glu Arg Gly Glu Asn Glu Tyr Arg Gly
385                 390                 395                 400

Ile Glu Leu Gly Tyr Arg Tyr Ser Gly Ser Pro Val Leu Trp Pro Glu
                405                 410                 415
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Gly Pro Gly Glu Pro Ser Asp Asp Pro Arg Ala Tyr Ala Pro Thr Thr
            420                 425                 430

Trp Pro Gly Ala Arg Pro Pro Ser Leu Leu Leu Ser Asp Gly Gln Gln
        435                 440                 445

Ile Phe Asp Arg Phe Asp Pro Ala Ser Phe Thr Leu Val Asp Phe Thr
    450                 455                 460

Gly Asp Gly Ala Ala Gly Pro Leu Leu Ala Ala Ala Ala Ala Arg Gly
465                 470                 475                 480

Leu Pro Val Thr His Thr Val Val Thr Asp Pro Arg Ala Arg Glu Leu
                485                 490                 495

Trp Glu Arg Asp Leu Val Leu Leu Arg Pro Asp His His Val Ala Trp
            500                 505                 510

Arg Gly Asn Thr Val Pro Pro Asp Pro Asp Ala Val Val Gln Arg Val
        515                 520                 525

Arg Gly Gly Gly
    530
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<210> 66
<211> 1599
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 66

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gccgacgacg tccgtgccgc cggcgtcgcg cccgagcacc gggccgacgt catctggtcg    240

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acctcgcgct ggcgtcccgg cttcatgctc gccgacaggt accgcgccgg ccgggtgctg 900

ctcgccggtg actcggccca ccggatgttc cccaccggcg cgtacggcat gaacaccggc 960

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acctcgcacc ggcacctggg cgtgcacctg cgggcgggcg agctcctgcg cggcggcgcc 1140

ccgctgccgt ccgtcgcggc cttcctcgac gccgagcggg gcgagaacga gtaccggggg 1200

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gtggacttca ccggtgacgg cgccgccggt ccgctgctgg cggcggcggc cgcgcggggg 1440

ctcccggtca cccacaccgt ggtgaccgac ccccgggctc gtgagctgtg ggaacgcgac 1500

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cccgacgccg tggtccagcg cgtgcggggt ggcggatag 1599

<210> 67
<211> 423
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 67

Met Gln Gln Ser Gly Ser Thr Ala Glu Arg Ser Pro Leu Gly Pro Trp
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Glu Gly Met Pro Ala Val Gln Gln Pro Asp Trp Gln Asp His Pro Ala
20 25 30

Tyr Ala Glu Thr Cys Gln Ala Leu Ala Ser Ala Pro Pro Leu Val Pro
35 40 45

Pro Gly Glu Val Arg Gly Phe Arg Gln Leu Leu Ser Glu Leu Ala Ser
50 55 60

Thr Asp Gly Leu Leu Leu Gln Leu Gly Asp Cys Ala Glu Ser Leu Tyr
65 70 75 80

Glu Cys Thr Pro Arg His Thr Ser Asp Lys Ile Glu Val Ile Asp Arg
85 90 95

Leu Gly Asp Arg Leu Ser Glu Leu Thr Gly Arg Asn Val Leu Arg Val
100 105 110

Gly Arg Met Ala Gly Gln Phe Ala Lys Pro Arg Ser Gln Ala Thr Glu

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        115                 120                 125

Trp His Asp Ala Leu Ser Ile Pro Ser Phe Arg Gly His Met Ile Asn
    130                 135                 140

Ser Glu Leu Ala Ala Pro Gly Thr Arg Lys Ala Asp Pro Arg Arg Met
145                 150                 155                 160

Trp Trp Ala Tyr Glu Ala Ser Asp Arg Val Gln Arg Val Leu Arg Ala
                165                 170                 175

His Arg Glu Gly Asn Arg Arg Ala Ala Arg Thr Glu Gly Pro Trp Ser
            180                 185                 190

Ser His Glu Ala Leu Val Val Asp Tyr Glu Ser Arg Leu Ile Arg Arg
        195                 200                 205

Asp Pro Asp Thr Gly Glu His Tyr Leu Ala Ser Thr His Leu Pro Trp
    210                 215                 220

Val Gly Glu Arg Thr Arg Arg Ser Ala Glu Ala His Val Ala Met Leu
225                 230                 235                 240

Ser Thr Val Val Asn Pro Val Gly Cys Lys Ile Gly Pro Asp Ala Asp
                245                 250                 255

Pro Asp Asp Val Leu Arg Val Cys Glu Ala Leu Asp Pro Arg Arg Asp
            260                 265                 270

Pro Gly Arg Leu Val Leu Ile Pro Arg Met Gly Arg Asp Arg Ile Arg
        275                 280                 285

Glu Ser Leu Pro Pro Ile Val Arg Ala Val Val Asn Ala Gly His Pro
    290                 295                 300

Val Leu Trp Leu Ser Asp Pro Met His Gly Asn Thr Val Lys Ala Ser
305                 310                 315                 320

Val Gly Leu Lys Thr Arg His Leu Ser Asp Val Val Thr Glu Ala Leu
                325                 330                 335

Trp Phe Arg Asp Ile Leu Asp Gln Gln Arg Gln His Ala Ala Gly Leu
            340                 345                 350

His Ile Glu Val Ala Ala Thr Asp Val Thr Glu Cys Val Gly Gly Ser
        355                 360                 365

Val Ala Gly Glu Glu Asp Leu Ala Arg His Tyr Thr Ser Leu Cys Asp
    370                 375                 380

Pro Arg Leu Asn Pro Gly Gln Ala Thr Glu Leu Ile Glu Ala Trp Ala
385                 390                 395                 400

Lys Asp Thr Ala Thr Val Gly Pro Gly Pro Arg Arg Ser Gly Pro Ser
                405                 410                 415

Ala Arg Pro Glu Val Ala Ala
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420

<210> 68
<211> 1272
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 68
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gcggtccagc aaccggactg gcaggaccac ccggcgtacg cggagacctg tcaggcgttg 120

gcgtcggccc cgccgctggt cccacccggg gaggtacggg ggttccggca gctgttgtcg 180

gagctggcgt cgaccgacgg gctcctgctg cagttgggcg actgcgccga gagcctctac 240

gagtgcaccc cccggcacac ctcggacaag atcgaggtca tcgaccggct gggggaccgg 300

ctcagcgagc tcaccgggcg caacgtgctg cgggtgggcc ggatggccgg gcagttcgcc 360

aagccccggt cgcaggcgac ggagtggcac gacgcgctga gcatcccctc cttccgcggc 420

cacatgatca attccgagct ggccgcgccc ggtacgcgca aggccgaccc tcgccgcatg 480

tggtgggcgt acgaggcgag cgaccgggtg cagcgggtcc tgcgcgccca ccgggagggc 540

aaccggcgtg ccgcgcggac cgaggggccg tggtcgagcc acgaggccct ggtcgtcgac 600

tacgagtccc gcctgatccg ccgggacccg gacacgggcg agcactacct ggcgtcgacc 660

cacctgccgt gggtggggga gcggacccgc cggtccgccg aggcgcacgt ggccatgctg 720

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gtcggcctga agacgcgcca cctctccgac gtggtcaccg aggcgctgtg gttccgcgac 1020

atcctcgacc agcagcggca gcacgccgcc gggctgcaca tcgaggtcgc cgccaccgac 1080

gtgaccgagt gcgtcggcgg ttcggtggcc ggcgaggagg acctggcgcg gcactacacc 1140

tcgctgtgcg acccgcggct caacccgggt caggccaccg agctgatcga agcgtgggcc 1200

aaggacaccg cgacggtcgg cccgggaccg cggcgctccg gcccttcggc gcggccggag 1260

gtcgccgcct ga 1272

<210> 69
<211> 340
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 69

Met Trp Gly Ser Ser Asn Thr Leu Glu Val Lys Gly Asn Asp Glu Arg
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Phe Pro Leu Pro Asp Ala Ala Thr Glu Asp Arg Ser Val Leu Gly Glu
20 25 30

Thr Val Pro Val Ser Ala Leu Leu Pro Gly Asp Ser Pro Arg Leu Ala
35 40 45

Gly Glu Asn Val Glu His Ile Arg Leu Leu Ala Ala Met His Asp Leu
50 55 60

Pro Pro Ile Leu Val Gln Arg Gly Thr Met Arg Val Ile Asp Gly Met
65 70 75 80

His Arg Leu Arg Ala Ala Lys Leu Arg Gly Asp Glu Thr Val Arg Val
85 90 95

Thr Phe Phe Asp Gly Asp Asp Ala Ala Ala Phe Leu Leu Ser Val Asp
100 105 110

Ala Asn Ile Lys His Gly Leu Pro Leu Ser Arg Ala Asp Arg Glu Ala
115 120 125

Ala Ala Thr Arg Ile Leu Arg Leu Tyr Pro Gln Trp Ser Asp Arg Ala
130 135 140

Val Ala Ala Ala Ala Gly Leu Ser Pro Thr Thr Ala Ser Gly Ile Arg
145 150 155 160

Arg Arg Leu Leu Gln Pro Ala Ala Arg Glu Gly Ser Arg Val Gly Arg
165 170 175

Asp Gly Arg Val Arg Pro Leu Asp Gly Ser Ala Gly Arg Arg Arg Ala
180 185 190

Ser Ala Val Ile Ala Leu Arg Pro Asp Ala Pro Leu Arg Ala Ile Ala
195 200 205

Gln Glu Ala Gly Val Ser Val Gly Thr Ala Arg Asp Val Arg Ala Arg
210 215 220

Leu Gln Ala Gly Arg Asp Pro Val Leu Thr Ser Gln Arg Pro Ala Ala
225 230 235 240

Glu Pro Glu Pro Ala Ala Asp Asp Gly Pro Glu Ala Arg Arg Arg Arg
245 250 255

Leu Gly Gln Pro Ser Val Pro Pro Val Asp Trp Pro Ala Val Arg Gly
260 265 270

Asn Leu Ile Arg Asp Pro Ala Val Lys Tyr Ala Glu Leu Gly Arg Ala
275 280 285

Phe Val Arg Trp Ala Asp Gly His Val Val Asp Pro Ala Ala Trp Arg
290 295 300

Glu Phe Val Asp Ala Val Pro Pro Tyr Trp Arg Lys Ser Val Ala Glu
305 310 315 320

Leu Ala Arg Ser Cys Ala Ser Ala Trp Leu Ala Phe Ala Gln Glu Leu
325 330 335

Glu Asp Arg Ala
340

<210> 70
<211> 1023
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 70
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gatgcagcta cggaggatcg gtctgtgctt ggcgagacgg ttccggtttc cgcgctgctg 120

cccggtgact ccccgcggct ggcgggcgag aacgtcgagc acatccggct gctggccgcg 180

atgcacgacc tcccgccgat cctggtgcaa cgcggcacga tgcgggtgat cgacggcatg 240

caccggctgc gggccgccaa gctgcgcggc gacgagaccg tgcgggtgac gttcttcgac 300

ggggacgacg ccgcggcgtt cctgctctcg gtcgacgcca acatcaaaca cgggctgccg 360

ttgtcccgcg ccgaccggga ggccgccgcc acccgcatcc tgcggttgta tccgcagtgg 420

tcggaccgcg ccgtcgccgc ggcggccggg ctgtcaccga ccacggcgag cggcatccgg 480

cgccgcctgc tgcaaccggc ggcgcgggag ggcagccggg tgggacggga cgggcgggtg 540

cgcccgctgg acggctcggc gggccgacgg cgggccagcg cggtcatcgc gctccggccg 600

gacgcgcccc tgcgtgccat cgcgcaggag gccggggtgt cggtgggcac ggcgcgggac 660

gtgcgcgccc ggttgcaggc gggccgggac cccgtcctga cctcgcagcg accggcggcc 720

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gcggcctggc gcgagttcgt cgacgccgtg ccgccgtact ggcgcaaatc ggtggccgag 960

ctggcccgtt cgtgcgccag cgcctggctg gcgttcgccc aggaactgga ggaccgggcg 1020

tga 1023

<210> 71
<211> 493

<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 71

Val Asn Ile Leu Arg Arg Pro Arg Lys Arg His Leu Gly Gly Val Ala
1 5 10 15

Ala Val Ala Ala Ala Ile Ala Leu Val Ala Ser Leu Thr Asn Gly Val
20 25 30

Ala Ala Ala Pro Gln Ala Pro Thr Phe Asp Leu Asp Asn Gly Asn Ala
35 40 45

Leu Thr Asp Val Ile Tyr Pro Ala Leu Asn Thr Glu Pro Arg Val Glu
50 55 60

Tyr Ser Gly Arg Pro Gly Ser Trp Ala Ala Asp Arg Ala Met Leu Ile
65 70 75 80

Glu Leu Pro Trp Phe Asp Ala Leu Ala Ala Tyr His Pro Thr Ala Val
85 90 95

Gly Ile Phe Ser Thr Ile Gly Arg Arg Pro Ala Glu Glu His Thr Thr
100 105 110

Arg Asn Lys Asn Ile Ala Val Ile Tyr Ser Ala Tyr Thr Ser Leu Ser
115 120 125

Lys Leu Tyr Pro Gln His Glu Ala Thr Trp Gln Arg Met Met Ala Thr
130 135 140

Ala Gly Leu Asp Pro Ala Val Thr Ala Glu Asp Arg Thr Thr Ala Ser
145 150 155 160

Gly Ile Gly Ile Leu Ala Ser Lys Asn Ala Met Ala Ala Arg Arg Asn
165 170 175

Asp Gly Thr Asn Arg Asp Gly Asp Ala Gly Gly Arg Arg Tyr Asn Arg
180 185 190

Glu Pro Tyr Ala Asp His Thr Gly Tyr Arg Pro Val Asn Ser Pro Tyr
195 200 205

Glu Leu Arg Phe Pro Ser Arg Trp Gln Pro Asn Thr Ile Ser Lys Arg
210 215 220

Glu Val Val Leu Thr Gln Glu Phe Ala Thr Pro Gln Phe Gly Arg Val
225 230 235 240

Lys Pro Ile Thr Phe Glu Arg Pro Glu Gln Phe Arg Leu Thr Pro Pro
245 250 255

Pro Asn His His Leu Leu Asn Pro Lys Gly Tyr Arg Lys Gln Ala Asp
260 265 270

Glu Val Leu Arg Ala Ser Ala Gly Leu Asp Asp Arg Lys Lys Met Ser

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        275                 280                 285

Ala Glu Ile Phe Ser Asp Asn Ile Thr Pro Tyr Gly Ala Ile Ala His
    290                 295                 300

Thr Leu Leu Arg Gly Arg Tyr Asn Thr Glu Asp Ser Val Arg Phe Ile
305                 310                 315                 320

Val Met Thr Asp Val Ala Gly Phe Asp Val Ala Ile Ala Ser Trp Tyr
                325                 330                 335

Tyr Met Arg Lys Tyr Asp Ser Val Gln Pro Phe Ser Ala Ile Arg His
            340                 345                 350

Leu Tyr Pro Asn Lys Lys Leu Thr Ala Trp Gly Gly Pro Gly Arg Gly
        355                 360                 365

Thr Val Asn Asp Ile Thr Gly Thr Gln Trp Arg Ser Tyr Leu Ser Ser
    370                 375                 380

Val Ala Ile Ala Ala Pro Asp Tyr Pro Ser Val Asn Ala Ala Val Cys
385                 390                 395                 400

Val Ala Tyr Ala Gln Val Ala Arg Arg Phe Thr Gly Thr Asp Lys Leu
                405                 410                 415

Thr Val Val Ile Pro Val Arg Lys Gly Ser Ser Ile Val Glu Pro Gly
            420                 425                 430

Val Thr Pro Ala Ala Asp Met Met Leu Thr Trp Asn Ser Tyr Ser Glu
        435                 440                 445

Trp Ala Ala Glu Cys Gly Gln Ser Arg Val Trp Ala Gly Glu Asn Phe
    450                 455                 460

Pro Ala Ser Val Ala Ala Ala Asp Gln Tyr Ala Pro Gln Ile Gly Asp
465                 470                 475                 480

Arg Ala Phe Asp Phe Val Gln Ser Lys Leu Asn Gly Arg
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<210> 72
<211> 1482
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 72
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ttcgacctcg acaacgggaa cgccctgacc gacgtcatct acccggccct caacaccgag 180

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gaactgccgt ggttcgacgc cctggcggcg taccacccca ccgcggtcgg catcttctcc 300

accatcggcc gccgtcccgc cgaggagcac acgacgcgca acaagaacat cgccgtcatc 360

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ggcatcggca tcctcgcctc gaagaacgcg atggcggcgc gccggaacga cggcacgaac 540

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cgtgccttcg acttcgtcca gagcaagctg aacgggcgct ga 1482

<210> 73
<211> 9762
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 73
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ccgatgaacg tggcggcgag caccgccgta cgggccgccg ccccctcgcc gggcttgacg 8880

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acgcccatga cgaacgagcg gcgggccacg tgcggctcgt cggcggccgg ggtgtccggc   9000

accggcgcgg ggccggtgtc cgtgtccggc ccggcgccgc ccgcgccgac agtgaccggc   9060

tgcgccgccg ggaccgtccg gcgcggccgg gtcgcccaga ggatcgtgcc gcccaggtag   9120

agcaggtaca gcgcgccggc gacgcgcagc accgtgtaga gcgtcggcga ggagaccagc   9180

agggcggaca ggccggcggt cgcgaacgac gcgtgcacca gcgcggcgac gaacagcccg   9240

gccagcacca cgaacccggc ccgccggccg tacctgacgg tctgccgggt gacgagcgcg   9300

aagtcgacgc ccggcacgat gatgatgagc aggctggcgg cgacgaaact gatgatctgg   9360

atgtcagaca cgacgccggc tctcctgtcc tccggcgagc gccggcactg cctcctcgat   9420

gacggagacg ccgctgtcct ggcgtggtcc gtgccggcgc cactgttccc gcagccggat   9480

ccggccgtcc ggcagccgtt cgggccggga ctcgcactcg ccgatgacta tggtgccgtc   9540

ggtgagcacc tccaggtagg cgaagcgcac gacgccctgc gcgtcgcagg tgccggccag   9600

ccggccgtgc cggaccgggc cgccggtgat ctccgcccag accaggtcgc cacgctggtg   9660

gtagtgcccc cgcagcggct cggcgccgtc accggcgtcg tggtccaccg agacgaagac   9720

gcggccgtcg tagtcgaatg tcgtcatcgc gctcacgccc ac                      9762
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<210> 74
<211> 112
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 74

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Met Asp Gly Ala Arg Glu Arg Ile Thr Thr Asn Ile Arg Lys Gly Val
1               5                  10                  15

Leu Glu Tyr Cys Val Leu Ala Leu Leu Ser Arg Arg Asp Met Tyr Gly
            20                  25                  30

Leu Glu Leu Ala Asp Trp Leu Ala Val Arg Gly Leu Thr Ala Ser Glu
        35                  40                  45

Gly Ser Leu Tyr Pro Leu Leu Ala Arg Met Arg Gln Ala Gly Ser Val
    50                  55                  60

Gln Thr Arg Trp Val Ala Pro Glu Gln Gly His Ala Arg Arg Tyr Tyr
65                  70                  75                  80

Ala Ile Thr Asp Gln Gly Arg Ala His Leu Arg Val Phe Ala Ala Val
                85                  90                  95
```

```
Trp Gln Glu Ile Gln Pro His Val Asp Asp Leu Met Gly Glu Glu Ala
            100                 105                 110

<210>  75
<211>  339
<212>  DNA
<213>  Micromonospora sp. strain 046-ECO11

<400>  75
atggacgggg cacgtgagcg gatcactacg aacatccgca agggcgtgct ggagtactgc     60

gtgctcgccc tgctctcgcg gcgcgacatg tacggcctgg aactggccga ctggctcgcc    120

gtccgcggtc tgaccgcgag cgagggcagc ctgtatccgc tgctcgcccg catgcggcag    180

gccggctccg tgcagacccg gtgggtggcc cccgagcagg ggcacgcccg gcggtactac    240

gcgatcaccg accaggggcg ggcgcacctg cgggtgttcg cggcggtgtg gcaggagatc    300

cagccgcacg tggacgacct gatgggggag gaagcatga                           339


<210>  76
<211>  325
<212>  PRT
<213>  Micromonospora sp. strain 046-ECO11

<400>  76

Met Ser Asp Asp Gly Leu Pro Glu Ala Ala Trp Thr Tyr Leu Arg Ala
1               5                   10                  15

Leu Asp Ala Glu Leu Ser Asp Val Pro Ser Gly Thr Ala Glu Glu Ile
            20                  25                  30

Val Ala Asp Val Arg Ala His Ile Ala Asp Ala Leu Asp Ser Gly Arg
        35                  40                  45

Ser Ala His Glu Ile Leu Ala Gly Leu Gly Ala Ala Arg Asp Val Ala
    50                  55                  60

Arg Gln Ala Arg Glu Glu Leu Gly Leu Pro Ala Gln Asp Arg Pro Ala
65                  70                  75                  80

Arg Ala Gly Arg Thr Leu Ser Leu Ala Ala Val Ala Val Gly Val Leu
                85                  90                  95

Ile Ala Val Cys Val Ser Phe Leu Leu Pro Ser Ala Val Pro Val Glu
            100                 105                 110

Pro Ile Gln Ala Gly Pro Gly Glu Gln Gly Val Leu Arg Arg Leu Gly
        115                 120                 125

Pro Gly Ile Ala Leu Leu Thr Leu Leu Pro Ala Leu Val Ala Ala Ala
    130                 135                 140

Pro Leu Val Ala Pro Ala Arg Ala Arg Ala Gly Val Arg Phe Ala Gly
```

```
145                 150                 155                 160

Ala Ala Val Leu Thr Met Phe Ala Cys Ala Ala Gly Glu Thr Gly Leu
                165                 170                 175

Tyr Tyr Phe Pro Leu Ala Leu Met Ala Trp Ala Ala Ala Ile Val Pro
            180                 185                 190

Trp Ala Leu Arg Arg Gly Ala Gly Gly Arg Trp Trp Arg Tyr Leu Thr
        195                 200                 205

Gly Gly Phe Val Ala Met Pro Gly Val Leu Val Ala Val Ala Ser Ala
    210                 215                 220

Gly Gly Ser Val Gly Val Gly Trp Val Gly Ala Ala Leu Trp Ile Ala
225                 230                 235                 240

Gly Pro Leu Ala Ala Gly Ala Leu Cys Ala Tyr Gly Ile Arg Ala Gly
                245                 250                 255

Tyr Ala Val Thr Ala Leu Ala Gly Ala Leu Ala Ile Ala Leu Ser Met
            260                 265                 270

Ala Glu Arg Gly Phe Leu Phe Ala Ala Phe Trp Leu Phe Gly Gly Leu
        275                 280                 285

Tyr Leu Ala Leu Gly Ala Ala Ala Tyr Thr Ala Ser Arg Ala Val Asp
    290                 295                 300

Gly Asp Ala Ala Ala Thr Pro Gly Pro Pro Ala Arg Pro Glu Pro Ala
305                 310                 315                 320

Pro Ala Pro Gly Gly
                325
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<210> 77
<211> 978
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 77

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gccgacgccc tcgacagcgg acggagcgcc cacgagatcc tcgccggcct cggcgccgcg    180

cgggacgtgg cccggcaggc gcgcgaggag ctggggctgc cggcccagga ccgcccggcc    240

cgggccggcc ggaccctgtc cctggccgcg gtggcggtcg gcgtgctgat cgccgtgtgc    300

gtgagcttcc tgctgccgtc cgcagtgccg gtggagccga tccaggccgg ccccggcgag    360

cagggcgtcc tccgccggct cggccccgga atcgcgctgc tcacgctgct gccggcgctc    420

gtcgcggccg cgccgctcgt ggcgcccgcc cgggcacgtg ccggggtacg gttcgccggc    480
```

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ggacggtggt ggcgctatct gaccggtgga ttcgtggcga tgcccggcgt gctggtggcg 660

gtcgcgtcgg ccggtggctc ggtcggcgtc ggctgggtcg gcgcggcgct gtggatcgcc 720

gggccgctcg cggccggcgc gctgtgcgcc tacgggatcc gggccggcta cgccgtgacc 780

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gccttctggc tgttcggcgg gctgtacctg gcgctcggcg ccgctgcgta caccgcctcg 900

cgggccgtcg acggcgacgc cgccgcgacg cccggcccgc cggcccggcc ggaacccgcg 960

ccggcccccg gaggctga 978

<210> 78
<211> 663
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 78

Met Leu Asp His Ala Ser Gly Arg Ile Asp Val Thr Arg Leu Arg Glu
1 5 10 15

Ala Leu Asp Gly Arg Trp Ala Glu Val Arg Arg Ala His Arg Glu His
20 25 30

Leu Asp Glu Arg Phe Leu Pro Val Tyr Gly Glu Thr Gly Asp Gln Ala
35 40 45

Arg Glu Arg Ile Thr Arg Leu Leu Ser Glu Leu Pro Val Glu Leu Gly
50 55 60

Ile Ala Ser Gly Phe Pro Ala Glu Tyr Gly Gly Arg Gly Asp Val Gly
65 70 75 80

Ala Ser Ile Val Ala Thr Glu Met Leu Ala Gln Val Asp Leu Ser Leu
85 90 95

Met Val Lys Ala Gly Val Gln Trp Gly Leu Phe Gly Gly Ala Val Ala
100 105 110

Ala Leu Gly Thr Lys Arg His His Asp Ala Tyr Leu Arg Asp Ile Val
115 120 125

Ala Gly Arg Leu Phe Gly Cys Phe Ala Met Thr Glu Thr Gly His Gly
130 135 140

Ser Asp Val Gln Gln Leu Arg Thr Thr Cys Val Tyr Asp Pro Gln Thr
145 150 155 160

Gln Thr Phe Asp Leu His Thr Pro His Glu Ala Ala Arg Lys Asp Tyr

```
                165                 170                 175

Ile Gly Asn Ala Ala Arg Asp Gly Arg Met Ala Val Val Phe Ala Gln
            180                 185                 190

Leu Val Thr Gly Gly Arg Arg His Gly Val His Ala Trp Leu Val Pro
        195                 200                 205

Ile Arg Asp Glu His Gly Lys Pro Met Pro Gly Val Thr Ile Gly Asp
    210                 215                 220

Ala Gly Pro Lys Ala Gly Leu Leu Gly Val Asp Asn Gly Arg Leu Ser
225                 230                 235                 240

Phe Asp His Val Arg Val Pro Arg Glu Met Leu Leu Asp Gln Tyr Ala
                245                 250                 255

Gln Val Ala Glu Asp Gly Thr Tyr Ser Ser Pro Ile Glu Asn Asp Ser
            260                 265                 270

Arg Arg Phe Phe Thr Met Leu Gly Thr Leu Val Arg Gly Arg Val Ser
        275                 280                 285

Val Gly Gly Ala Ala Ser Ala Ala Thr Lys Ser Ala Leu Ala Ile Ala
    290                 295                 300

Val Arg Tyr Gly Asp Ile Arg Arg Gln Phe Ala Asp Ala Asp Gly Asp
305                 310                 315                 320

Arg Glu Val Leu Leu Asn Asp Tyr Leu Ala His Gln Arg Lys Leu Leu
                325                 330                 335

Pro Ala Leu Ala Thr Thr Tyr Ala Leu Thr Phe Ala Gln Ala Glu Leu
            340                 345                 350

Val Ala Ala Leu Asp Asp Ile Gln Gly Gly Asp Gly Pro Val Asp Glu
        355                 360                 365

His Arg Gln Arg Glu Leu Glu Ser Arg Ala Ala Gly Leu Lys Ala Ala
    370                 375                 380

Gln Thr Trp His Ala Thr Arg Thr Ile Gln Ile Cys Arg Glu Ala Cys
385                 390                 395                 400

Gly Gly Ala Gly Tyr Leu Ser Glu Asn Arg Leu Pro Ser Leu Lys Ala
                405                 410                 415

Asp Thr Asp Val Phe Thr Thr Phe Glu Gly Asp Asn Thr Val Leu Leu
            420                 425                 430

Gln Leu Val Ala Lys Gly Leu Leu Thr Gly Tyr Arg Asp Glu Phe Gly
        435                 440                 445

Ser Leu Asp Gly Trp Gly Arg Ala Ser Phe Val Ala Glu Gln Val Arg
    450                 455                 460

Glu Met Val Leu Glu Arg Thr Ala Ala Arg Ala Leu Ile Ala Arg Leu
```

```
465                 470                 475                 480

Val Ser Ala Val Pro Gly Arg Asp Asp Glu Val Ala Val Thr Asp Arg
                485                 490                 495

Gly Trp Gln Leu Lys Leu Phe Glu Asp Arg Glu Glu His Leu Leu Asp
            500                 505                 510

Ser Ala Val Arg Arg Leu Arg Gly Gly Ala Ser Thr Lys Lys Asp Arg
        515                 520                 525

Pro Phe Asp Ile Phe Asn Asp Val Gln Asp His Val Leu Ala Val Ala
    530                 535                 540

Ala Ala His Ile Asp Arg Val Thr Leu Glu Ala Phe Val Ala Gly Ile
545                 550                 555                 560

Asp Ala Ile Ala Asp Pro Ala Val Lys Glu Leu Leu Ser Arg Val Cys
                565                 570                 575

Asp Leu Tyr Ala Leu Thr Val Ile Glu Ala Asn Lys Gly Trp Leu Leu
            580                 585                 590

Glu His Gly Arg Leu Thr Pro Ala Arg Ser Lys Thr Ile Thr Ser Val
        595                 600                 605

Val Asn Gly Leu Leu Lys Glu Leu Arg Pro Asp Met Arg Thr Leu Val
    610                 615                 620

Asp Gly Phe Ala Ile Pro Asp Ala Trp Leu His Ala Ala Ile Leu Arg
625                 630                 635                 640

Glu Glu Pro Val Arg Gln Glu Thr Met Ala Ala His Asp Ala Ala Gly
                645                 650                 655

Asp Pro Gln Ala Val Pro Ala
            660
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<210> 79
<211> 1992
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 79

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ggcgtgcagt ggggcctgtt cggcggcgcg gtcgccgccc tcggcacgaa gcggcaccac    360

gacgcctacc tgcgggacat cgtcgcgggc cggctcttcg gctgcttcgc gatgaccgag    420
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ggggtgcacg cctggctggt gccgatccgc gacgagcacg gcaagccgat gcccggcgtg 660

accatcggcg acgccgggcc caaggccggc ctgctcggcg tggacaacgg gcggctcagc 720

ttcgaccacg tgcgggtgcc gcgggagatg ctgctggacc agtacgcgca ggtcgccgag 780

gacggcacgt actccagccc gatcgagaac gactcccggc gcttcttcac catgctgggc 840

accctggtcc ggggccgggt gagcgtgggc ggcgccgcgt cggcggccac caagtcggcg 900

ctggccatcg cggtgcgcta cggcgacatc cgccggcagt tcgccgacgc cgacggcgac 960

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gaggagcccg tccggcagga gacgatggcc gcgcacgacg ccgccggcga cccgcaggcc 1980

gtccccgcct ag 1992

<210> 80

<211> 573
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 80

Val Ser Pro Leu Pro Pro Gly Ser Ala Val Thr Ala Arg His Val Leu
1 5 10 15

Arg Gln Ala Leu Arg Arg Gln Arg Arg Pro Val Leu Ile Gly Val Thr
20 25 30

Leu Leu Gly Leu His Gln Val Thr Glu Ala Leu Val Pro Val Ala Ile
35 40 45

Gly Val Ile Ile Asp Arg Ala Val Val Thr Gly Asp Pro Trp Ala Leu
50 55 60

Ala Tyr Ser Val Ala Gly Leu Ala Ala Leu Phe Thr Val Leu Ala Phe
65 70 75 80

Ala Tyr Arg Asn Gly Ala Arg Gln Ala Phe Ala Ala Val Glu Arg Glu
85 90 95

Ala His Leu Leu Arg Val Glu Leu Ala Glu Arg Ala Leu Asp Pro Arg
100 105 110

Gly His Arg Ser Gly Leu Arg Asp Gly Glu Leu Leu Ser Val Ala Ala
115 120 125

Ser Asp Ala Glu Leu Ser Ala Tyr Val Val Arg Val Ala Gly Phe Gly
130 135 140

Val Ala Ala Val Ser Ala Leu Thr Val Ala Ala Val Ala Leu Leu Val
145 150 155 160

Ile Asp Val Pro Leu Gly Leu Gly Val Leu Ile Gly Val Pro Val Leu
165 170 175

Val Leu Ala Leu Gln Arg Met Ala Pro Leu Leu Ser Arg Arg Ser Ala
180 185 190

Ser Gln Gln Glu Ala Leu Ala Glu Thr Thr Ala Leu Ala Val Asp Leu
195 200 205

Val Ser Gly Leu Arg Val Leu Arg Gly Ile Gly Ala Gln His His Ala
210 215 220

Ala Gly Arg Tyr Ala Glu Ala Ser Arg Arg Ala Leu Ala Val Thr Leu
225 230 235 240

Arg Ala Ala Asn Thr Lys Gly Leu His Leu Gly Leu Thr Thr Ala Ala
245 250 255

Asn Gly Leu Phe Leu Ala Ala Val Ala Gly Val Ala Gly Trp Leu Ala
260 265 270

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Leu Arg Gly Arg Leu Thr Ile Gly Glu Leu Val Thr Val Val Gly Leu
        275                 280                 285

Ala Gln Phe Val Ala Glu Pro Val Gln Thr Leu Gly Tyr Cys Val Gln
    290                 295                 300

Leu Phe Ala Met Ala Arg Ala Ser Ala Ala Arg Val Gly Arg Val Leu
305                 310                 315                 320

Gly Ala Glu Pro Leu Thr Arg Pro Gly Ser Ala Pro Arg Pro Asp Arg
                325                 330                 335

Thr Asp Gly Pro Arg Leu Val Leu Asp His Val Gly His Ala Ala Leu
            340                 345                 350

Asp Gly Val Cys Leu Arg Val Asp Pro Gly Glu Ile Val Gly Val Leu
        355                 360                 365

Ala Tyr Asp Pro Ala Asp Ala Asp Ala Leu Val Ala Leu Leu Ser Gly
    370                 375                 380

Arg Val Pro Ala Asp Arg Arg Arg Gly Thr Val Arg Val Asp Gly Val
385                 390                 395                 400

Pro Ala Asp Asp Leu Asp Val Asp Ala Leu Arg Gly Ala Val Leu Val
                405                 410                 415

Glu Pro His Asp Val Thr Leu Phe Glu Gly Thr Val Ala Ala Asn Leu
            420                 425                 430

Ala Ala Gly Ser Arg Thr Glu Glu Gly Arg Leu Arg Ala Ala Val Arg
        435                 440                 445

Ala Ala Ala Ala Asp Asp Val Val Asp Ala His Pro Gly Gly Leu Gly
    450                 455                 460

His Arg Leu Val Glu Arg Gly Ala Asn Leu Ser Gly Gly Gln Arg Gln
465                 470                 475                 480

Arg Leu Gly Leu Ala Arg Ala Leu His Ala Asp Pro Pro Val Leu Val
                485                 490                 495

Leu His Asp Pro Thr Thr Ala Val Asp Ala Ala Thr Glu Ala Gln Leu
            500                 505                 510

Ala Asp Gly Leu Ala Gly Ala Arg Arg Glu Ala Pro Arg Gly Thr Leu
        515                 520                 525

Leu Val Thr Ser Ser Pro Ala Leu Leu Arg Ile Thr Asp Arg Val Val
    530                 535                 540

Val Ile Ala Asp Gly Arg Val Thr Ala Glu Gly Thr His Glu His Leu
545                 550                 555                 560

Leu Ala Thr Asp Ala Arg Tyr Arg Glu Glu Thr Leu Arg
                565                 570
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<210> 81
<211> 1722
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 81
gtgtccccgc ttccccccgg cagcgccgtc accgcccggc acgtgctccg ccaggcgctg 60

cgccgccagc gccgcccggt gctgatcggc gtgaccctgc tcgggctgca ccaggtcacc 120

gaggcgctcg tgccggtggc gatcggcgtc atcatcgacc gggccgtggt gaccggcgac 180

ccgtgggcgc tcgcgtactc cgtcgccggc ctcgccgccc tgttcaccgt gctggcgttc 240

gcctaccgca acggcgcccg ccaggcgttc gcggcggtgg aacgggaggc gcacctgctg 300

cgggtcgagc tggccgagcg cgcgctcgac ccgcgcgggc accgctccgg cctgcgcgac 360

ggcgagctgc tctcggtcgc cgcctccgac gccgaactct ccgcgtacgt ggtccgggtg 420

gccggcttcg gcgtcgccgc ggtgagcgcg ctgaccgtcg cggcggtcgc gctgctggtc 480

atcgacgtcc cgctcggact cggcgtgctc atcggcgtac cggtgctggt cctggcgctg 540

caacggatgg cgccgctgct gtcccggcgc agcgcctccc agcaggaggc cctcgcggag 600

accacggcgc tcgccgtgga cctcgtctcc ggcctgcgcg tgctgcgcgg catcggcgcc 660

cagcaccacg ccgccggccg gtacgccgag gccagccgac gcgccctcgc cgtgacgctg 720

cgcgccgcca acaccaaggg cctgcacctc gggctcacca ccgccgcgaa cggcctcttc 780

ctcgccgccg tcgccggggt cgccggctgg ctcgcgctgc gcggccggct caccatcggc 840

gagctggtca ccgtggtcgg gctcgcgcag ttcgtcgccg agccggtgca gacgctgggc 900

tactgcgtgc agctgttcgc gatggcccgc gcctccgccg cccgggtcgg gcgcgtgctc 960

ggcgccgagc cgctgacccg gccgggcagc gcgccccggc cggaccgcac ggacgggccg 1020

cggctcgtcc tcgaccacgt cggccacgcc gcgctggacg gggtgtgcct gcgcgtcgac 1080

ccgggagaga tcgtcggcgt cctggcgtac gacccggccg acgcggacgc gctggtggcg 1140

ctgctgtccg ggcgggtgcc cgcggaccgg cgccggggca cggtacgcgt cgacggggta 1200

cccgccgacg acctggacgt cgacgcgctg cgcggcgccg tcctggtcga gccgcacgac 1260

gtgacgctgt tcgagggaac cgtggccgcc aacctcgccg ccgggagcag gaccgaggag 1320

gggcgcctgc gcgccgcggt ccgggcggcc gcggcggacg acgtggtgga cgcgcacccc 1380

ggcggcctcg gccaccggct cgtcgagcgg ggcgccaacc tctccggcgg gcagcgccag 1440

cggctcgggc tggcgcgggc gctgcacgcc gacccgccgg tgctggtgct gcacgacccc 1500

accaccgccg tggacgcggc caccgaggcc caactcgccg acggactggc cggcgcgcgc 1560

cgcgaagcgc cccggggcac gctgctggtc accagcagcc ccgccctgct gcggatcacc 1620

gaccgggtgg tggtgatcgc cgacggccgg gtgaccgccg aggggacgca cgagcacctg 1680

ctggccaccg acgcccgcta ccgcgaggag acactgcggt ga 1722

<210> 82
<211> 596
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 82

Val Thr Ala Asp Pro Arg Thr Ala Glu Pro Thr Arg Val Leu Leu Pro
1 5 10 15

Thr Ala Thr Ala Arg Arg Thr Trp Thr Thr Leu Gly Ala Glu Phe Arg
20 25 30

Arg Arg Pro Gly Leu Ser Ala Ala Ala Thr Ala Val Leu Val Ala Ala
35 40 45

Ala Thr Gly Gly Leu Val Ala Pro Trp Val Leu Gly Arg Leu Val Asp
50 55 60

Asp Val Ile Ala Asp Ala Pro Val Ser Arg Ile Ala Gly Arg Val Ala
65 70 75 80

Val Ile Ala Gly Ala Ala Val Leu Thr Gly Leu Leu Thr Ala Ala Gly
85 90 95

Ala Ala Leu Ala Ser Arg Leu Gly Glu Thr Val Leu Ala Arg Leu Arg
100 105 110

Glu Arg Val Leu Asp Arg Ala Leu His Leu Pro Ser Ala Thr Leu Glu
115 120 125

Arg Ala Gly Thr Gly Asp Leu Leu Ala Arg Val Gly Asp Asp Val Ala
130 135 140

Val Val Thr Asn Val Ile Ala Val Ser Gly Pro Ala Phe Val Gly Ala
145 150 155 160

Leu Leu Ser Val Val Leu Thr Val Phe Gly Leu Val Ala Leu Asp Trp
165 170 175

Arg Leu Gly Leu Ala Gly Leu Val Ala Ala Pro Ala Tyr Ala Leu Ala
180 185 190

Leu Arg Trp Tyr Leu Arg Arg Ser Ala Pro Tyr Tyr Ala Arg Glu Arg
195 200 205

Val Ala Thr Gly Glu Arg Thr Gln Ala Met Ala Gly Ala Leu Arg Gly
210 215 220

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Ala Ala Thr Val Arg Ala Tyr Arg Thr Glu Asp Ala His Val Ala Ala
225                 230                 235                 240

Ile Ala Glu Arg Ser Gly Val Ala Arg Asp Leu Ser Leu Glu Ile Phe
                245                 250                 255

Asn Leu His Thr Arg Phe Gly Leu Arg Ile Asn Arg Ser Glu Phe Leu
            260                 265                 270

Gly Leu Ala Ala Val Leu Val Ala Gly Phe Phe Leu Val Arg Ala Asp
        275                 280                 285

Leu Val Thr Val Gly Ala Ala Thr Thr Ala Ala Leu Tyr Phe His Arg
    290                 295                 300

Leu Phe Asn Pro Ile Gly Leu Leu Leu Met Glu Ser Asp Ser Val Leu
305                 310                 315                 320

Gln Ala Gly Ala Ser Leu Ala Arg Leu Val Gly Val Ala Thr Leu Pro
                325                 330                 335

Asp Thr Ala Pro Ser Gly Pro Ala Pro Ser Ala Ala Gly Arg Arg Gly
            340                 345                 350

Pro Ala Ala Leu Asp Val Thr Val Arg Arg His Arg Tyr Asp Asp Asp
        355                 360                 365

Gly Pro Leu Val Leu Ala Asp Val Asp Leu Arg Leu Ala Pro Gly Glu
    370                 375                 380

Arg Val Ala Leu Val Gly Ala Ser Gly Ala Gly Lys Ser Thr Leu Ala
385                 390                 395                 400

Gly Ile Ala Ala Gly Ile Ile Ala Pro Thr Asp Gly Ser Val Arg Leu
                405                 410                 415

Gly Gly Val Pro Leu Thr Glu Arg Gly Glu His Ala Val Arg Arg Asp
            420                 425                 430

Val Ala Leu Val Ser Gln Glu Val His Val Phe Ala Gly Pro Leu Ala
        435                 440                 445

Glu Asp Leu Arg Leu Ala Ala Pro Asp Ala Thr Asp Ala Glu Leu Leu
    450                 455                 460

Asp Ala Leu Asp Arg Val Gly Ala Thr Thr Trp Leu Arg Ala Leu Pro
465                 470                 475                 480

Asp Gly Leu Ala Thr Ala Val Gly Glu Gly Gly His Arg Leu Thr Ala
                485                 490                 495

Ala Gln Ala Gln Gln Val Ala Leu Ala Arg Leu Val Leu Ala Ala Pro
            500                 505                 510

Ala Val Ala Val Leu Asp Glu Ala Thr Ala Glu Ala Gly Ser Ala Gly
        515                 520                 525
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Ala Arg Asp Leu Asp Arg Ala Ala Leu Ala Ala Thr Glu Gly Arg Thr
530 535 540

Thr Leu Ile Val Ala His Arg Leu Ser Gln Ala Val Ala Ala Asp Arg
545 550 555 560

Ile Val Leu Leu Asp His Gly Arg Ile Val Glu Gln Gly Thr His Ser
565 570 575

Glu Leu Leu Ala Ala Asp Gly Arg Tyr Gly His Leu Trp Arg Ser Trp
580 585 590

Ser Val Pro Val
595

<210> 83
<211> 1791
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 83
gtgaccgctg acccgcgtac cgccgaaccc acccgggtgt tgctgcccac cgcgaccgcc 60

cggcggacct ggacgacgct cggcgcggag ttccgccggc ggcccggcct cagcgccgcc 120

gcgaccgccg tgctcgtcgc cgccgccacc ggcgggctgg tcgcgccctg ggtgctcggc 180

cgcctcgtcg acgacgtcat cgccgacgcc ccggtctccc ggatcgccgg ccgggtggcg 240

gtgatcgccg gcgcggcagt gctcaccgga ctgctcaccg ccgccggggc cgcgctcgcg 300

tcccgcctgg gggagacggt gctggcccgg ctgcgcgagc gggtcctcga ccgggcgctg 360

cacctgccct cggcgacgct ggaacgggcc ggcaccggcg acctgctggc ccgggtcggc 420

gacgacgtgg cggtggtgac gaacgtgatc gcggtcagcg gcccggcgtt cgtcggcgcg 480

ctgctgtccg tggtgctgac cgtgttcggg ctggtcgcgc tcgactggcg gctcggcctc 540

gccgggctgg tcgccgcgcc cgcctacgcg ctggcgctgc gctggtacct gcgccggtcg 600

gcgccgtact acgcccgcga gcgcgtcgcc accggcgagc ggacgcaggc gatggccggc 660

gcgctgcgtg gcgcggccac cgtgcgcgcg taccggaccg aggacgcgca cgtcgcggcg 720

atcgccgagc gctccggcgt ggcgcgcgac ctgtcgctgg agatcttcaa cctgcacacc 780

cggttcgggc tgcggatcaa caggtcggag ttcctcggcc tggccgcggt gctcgtcgcc 840

gggttcttcc tggtccgcgc cgacctggtc acagtgggcg cggcgaccac cgccgcgctc 900

tacttccacc ggctgttcaa cccgatcggc ctgctgctga tggagtccga ctcggtgctg 960

caggccggcg cgagcctcgc ccggctggtc ggcgtggcca cgctgcccga caccgccccg 1020

tccgggcccg cgccgtcggc ggccgggcgg cgcggcccgg cggcgctgga cgtcacggtc 1080

cgccggcacc gctacgacga cgacggccct ctggtcctgg ccgacgtcga cctgcgcctg 1140

gccccgggcg agcgggtcgc gctcgtgggc gccagcggcg cgggcaagag cacgctcgcc 1200

ggcatcgccg ccgggatcat cgcgcccacc gacgggtcgg tacgcctggg cggcgtgccg 1260

ctgaccgagc ggggcgagca cgccgtgcgg cgcgacgtcg cgctggtcag ccaggaggtg 1320

cacgtcttcg ctggaccgct cgccgaggat ctgcgcctgg ctgccccgga cgccaccgac 1380

gccgaactgc tcgacgcgct ggaccgggtc ggcgccacca cctggctgcg cgcgctgccg 1440

gacgggctgg ccacagcggt cggcgagggc ggccaccggc tcaccgccgc gcaggcccag 1500

caggtcgccc tggcccggct ggtgctggcc gcgcccgccg tcgccgtgct ggacgaggcc 1560

accgccgagg ccggcagcgc cggagcgcgt gacctggacc gggcggcgct ggccgccacc 1620

gagggacgga ccacgctgat cgtggcgcac cggctcagcc aggcggtcgc cgccgaccgg 1680

atcgtcctgc tcgaccacgg gcggatcgtg gagcagggca cgcactcgga actgctcgcc 1740

gccgacggcc ggtacgggca tctgtggcgc tcctggagcg tcccggtatg a 1791

<210> 84
<211> 507
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 84

Met Thr Asp Ala Pro Ala Arg Phe Val Leu Phe Pro Gly Arg His His
1 5 10 15

Leu Leu Thr Arg Phe Gln Ala Asp Tyr Leu Arg Arg Leu Ala Gly Asp
20 25 30

Asp Ala Thr Val Val Trp Ala Val Thr Ser Ala Asn His Glu Asn Thr
35 40 45

Arg Arg Asn Pro Val Pro Tyr His Arg Arg Glu Ala Ala Ile Glu Arg
50 55 60

Phe Ser Val Leu Ser Gly Leu Arg Ser Val Val Val Pro Ile Phe Asp
65 70 75 80

Thr Ala Tyr Thr Asp Ala Phe Ala Glu Val Thr Leu Lys Ser Ile Ala
85 90 95

Val Ala Thr Gly Leu Glu Leu Thr Pro Ala Asp Thr Val Leu Ala Cys
100 105 110

Ser Thr Pro Glu Val Ala Lys Leu Tyr Glu Gln Leu Gly Phe Ser Ile
115 120 125

Ala Pro Val Glu Ala Asp Pro Asp Leu Pro Glu Pro Pro Glu Arg Pro

```
    130                 135                 140

Trp Asp Val Leu Leu Arg Leu Ala Ala Gly Asp Glu Thr Trp Arg Ala
145                 150                 155                 160

Leu Thr His Pro Ala Thr Ile Asp Val Phe Glu Arg Tyr Arg Leu Val
                165                 170                 175

Glu Ser Ile Arg Ser Val Val Asn Asp Pro Leu Val Gly Asp Glu Gly
            180                 185                 190

Gly Leu Thr Val Thr Arg Asp Tyr Arg Thr Tyr Val Glu Ala Phe Ala
        195                 200                 205

Thr Ala Ala Gln Arg Lys Trp Asp Ser Val Arg Arg Tyr Val Gln Pro
    210                 215                 220

Gly Arg Ile Val Asp Ile Gly Cys Gly Ala Gly Ala Val Leu Glu Leu
225                 230                 235                 240

Ala Asp Arg Glu Ala Ala Leu Arg Glu Ser Asp Leu Ile Gly Val Glu
                245                 250                 255

Val Ala Arg His Leu Tyr Gln Glu Cys Leu His Lys Lys Ala Gln Gly
            260                 265                 270

Val Phe Arg Asn Ala Asn Val Tyr Phe Phe His Arg Asn Val Leu Gly
        275                 280                 285

Gly Ala Val Phe Lys Asp Arg Ser Val Asp Thr Thr Leu Thr Phe Ala
    290                 295                 300

Leu Thr His Glu Ile Trp Ser Tyr Gly Arg Arg Arg Glu Ser Leu Leu
305                 310                 315                 320

Gln Phe Ala Arg Arg Ile His Asp His Thr Val Pro Gly Gly Val Trp
                325                 330                 335

Ile Asn Ser Asp Val Cys Gly Pro Asp Asp Pro Arg Arg Gln Val Leu
            340                 345                 350

Leu Arg Leu Ser Thr Asp Asp Gly Asp Asn Pro Ala Ala Pro Arg Pro
        355                 360                 365

Asp Leu Ala Glu Leu Thr Ser Ala Glu Val Arg Arg Tyr Val Gly Gly
    370                 375                 380

Leu Ser Thr Arg Ala Arg Leu Asp Gln Phe Ala Val Asp Phe Ala Phe
385                 390                 395                 400

Asp Phe Asp Tyr Glu Pro Leu Pro Asp Gly Ala Val Arg Leu Thr Leu
                405                 410                 415

Gly Ala Ala Met Asp Tyr Leu Thr Arg Lys Asp Tyr Thr Asp Asn Trp
            420                 425                 430

Leu Ser Glu Thr Gln Glu Gln Phe Cys Gly Leu Ser Phe Ala Asp Trp
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435 440 445

Thr Asp Leu Leu Thr Glu Ala Gly Phe Glu Ile Gly Pro Ala Ser Ala
450 455 460

Pro Val Arg Asn Glu Trp Val Ile Asp Asn Arg Ile Ala Pro Val Ala
465 470 475 480

Ser Leu Thr Asp Leu Asp Gly Arg Pro Leu Asp Trp Pro Thr Thr His
485 490 495

Val Leu Thr Val Ala His Arg Pro Arg Asn Gln
500 505

<210> 85
<211> 1524
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 85
atgaccgacg cgccggcccg cttcgtgctc ttcccggggc ggcaccacct gctgacccgg 60

ttccaggccg actacctgcg gcggctggcc ggggacgacg ccacagtggt ctgggcggtg 120

acgtcggcca accacgagaa caccaggcgc aacccggtgc cctaccaccg gcgggaggcc 180

gcgatcgaac gattcagcgt gctgagcggg ctgcgctcgg tggtggtgcc gatcttcgac 240

accgcgtaca ccgacgcgtt cgccgaggtg acgctgaagt ccatcgcggt ggccaccggg 300

ctcgaactca cccccgccga caccgtgctg gcctgctcca cgccggaggt cgcgaagctg 360

tacgagcagc tcggcttttc gatcgcgccg gtcgaggcgg acccggacct gcccgagccg 420

cccgaacggc cgtgggacgt gctgctgcgc ctggccgccg gggacgagac ctggcgcgcg 480

ctcacccacc cggccaccat cgacgtgttc gagcgctacc gcctggtcga gtcgatccgg 540

tcggtggtga acgacccgct cgtcggcgac gagggcggtc tcacagtgac ccgcgactac 600

cggacctacg tcgaggcgtt cgccacggcc gcgcagcgca agtgggactc ggtacgccgg 660

tacgtgcagc ccggccgcat cgtggacatc ggctgcggcg cgggcgccgt cctggaactc 720

gccgaccggg aggccgcgct gcgtgagagc gacctgatcg gcgtggaggt cgcccgccac 780

ctctaccagg agtgcctgca caagaaggcg cagggcgtgt tccgcaacgc caacgtctac 840

ttcttccacc gcaacgtcct cggcggcgcg gtgttcaagg accgctcggt cgacaccacg 900

ctcacgttcg cgctgaccca cgagatctgg tcgtacgggc ggcggcggga gtcgctgctg 960

cagttcgccc gccgcatcca cgaccacacg gtgcccggcg gcgtctggat caacagcgac 1020

gtgtgcggtc cggacgaccc ccggcggcag gtgctcctgc gactgtccac cgacgacggc 1080

gacaacccgg ccgcgccccg ccccgacctc gccgagctga cctcggcgga ggtccggcgt 1140

tacgtcggcg ggctgtcgac gcgggcgcgg ctggaccagt tcgccgtcga cttcgcgttc 1200

gacttcgact acgagccgct ccccgacggc gcggtacgcc tgacgctggg cgccgcgatg 1260

gactacctga cccgcaagga ctacacggac aactggctgt cggagacgca ggagcagttc 1320

tgcggcctga gcttcgccga ctggacggac ctgctcaccg aggcggggtt cgagatcggc 1380

ccggcgtcgg cgccggtgcg caacgagtgg gtgatcgaca accggatcgc gccagtcgcg 1440

tccctcaccg acctcgacgg ccggccgctg gactggccga ccacccacgt cctcaccgtc 1500

gcccaccgcc cccgcaacca gtga 1524

<210> 86
<211> 232
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 86

Val Ser Asp Ile Gln Ile Ile Ser Phe Val Ala Ala Ser Leu Leu Ile
1 5 10 15

Ile Ile Val Pro Gly Val Asp Phe Ala Leu Val Thr Arg Gln Thr Val
20 25 30

Arg Tyr Gly Arg Arg Ala Gly Phe Val Val Leu Ala Gly Leu Phe Val
35 40 45

Ala Ala Leu Val His Ala Ser Phe Ala Thr Ala Gly Leu Ser Ala Leu
50 55 60

Leu Val Ser Ser Pro Thr Leu Tyr Thr Val Leu Arg Val Ala Gly Ala
65 70 75 80

Leu Tyr Leu Leu Tyr Leu Gly Gly Thr Ile Leu Trp Ala Thr Arg Pro
85 90 95

Arg Arg Thr Val Pro Ala Ala Gln Pro Val Thr Val Gly Ala Gly Gly
100 105 110

Ala Gly Pro Asp Thr Asp Thr Gly Pro Ala Pro Val Pro Asp Thr Pro
115 120 125

Ala Ala Asp Glu Pro His Val Ala Arg Arg Ser Phe Val Met Gly Val
130 135 140

Thr Ser Gln Leu Leu Asn Val Lys Val Val Val Phe Tyr Val Ser Phe
145 150 155 160

Val Pro Gln Phe Val Lys Pro Gly Glu Gly Ala Ala Ala Arg Thr Ala
165 170 175

Val Leu Ala Ala Thr Phe Ile Gly Leu Ala Val Leu Trp Trp Ala Cys

180 185 190

Tyr Ile Met Leu Ile Asp Arg Leu Gln Pro Trp Leu Thr Arg Pro Ser
195 200 205

Val Leu Leu Val Ile Glu Arg Leu Thr Gly Leu Ile Leu Ile Val Leu
210 215 220

Ala Ile Arg Ile Ala Leu Ser Arg
225 230

<210> 87
<211> 699
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 87
gtgtctgaca tccagatcat cagtttcgtc gccgccagcc tgctcatcat catcgtgccg 60

ggcgtcgact tcgcgctcgt cacccggcag accgtcaggt acggccggcg ggccgggttc 120

gtggtgctgg ccgggctgtt cgtcgccgcg ctggtgcacg cgtcgttcgc gaccgccggc 180

ctgtccgccc tgctggtctc ctcgccgacg ctctacacgg tgctgcgcgt cgccggcgcg 240

ctgtacctgc tctacctggg cggcacgatc ctctgggcga cccggccgcg ccggacggtc 300

ccggcggcgc agccggtcac tgtcggcgcg ggcggcgccg ggccggacac ggacaccggc 360

cccgcgccgg tgccggacac cccggccgcc gacgagccgc acgtggcccg ccgctcgttc 420

gtcatgggcg tcaccagcca gctgctgaac gtcaaggtgg tcgtcttcta cgtctcgttc 480

gtgccgcagt tcgtcaagcc cggcgagggg gcggcggccc gtacggcggt gctcgccgcc 540

acgttcatcg gcctcgcggt gctctggtgg gcctgctaca tcatgctcat cgacaggttg 600

cagccctggc tgacccggcc gtccgtgctg ctggtgatcg aacggctgac cgggctcatc 660

ctgatcgtcc tggcgatccg gatcgcgctg agccggtga 699

<210> 88
<211> 132
<212> PRT
<213> Micromonospora sp. strain 046-ECO11

<400> 88

Val Gly Val Ser Ala Met Thr Thr Phe Asp Tyr Asp Gly Arg Val Phe
1 5 10 15

Val Ser Val Asp His Asp Ala Gly Asp Gly Ala Glu Pro Leu Arg Gly
20 25 30

His Tyr His Gln Arg Gly Asp Leu Val Trp Ala Glu Ile Thr Gly Gly
35 40 45

Pro Val Arg His Gly Arg Leu Ala Gly Thr Cys Asp Ala Gln Gly Val
50 55 60

Val Arg Phe Ala Tyr Leu Glu Val Leu Thr Asp Gly Thr Ile Val Ile
65 70 75 80

Gly Glu Cys Glu Ser Arg Pro Glu Arg Leu Pro Asp Gly Arg Ile Arg
85 90 95

Leu Arg Glu Gln Trp Arg Arg His Gly Pro Arg Gln Asp Ser Gly Val
100 105 110

Ser Val Ile Glu Glu Ala Val Pro Ala Leu Ala Gly Gly Gln Glu Ser
115 120 125

Arg Arg Arg Val
130

<210> 89
<211> 399
<212> DNA
<213> Micromonospora sp. strain 046-ECO11

<400> 89
gtgggcgtga gcgcgatgac gacattcgac tacgacggcc gcgtcttcgt ctcggtggac 60

cacgacgccg gtgacggcgc cgagccgctg cgggggcact accaccagcg tggcgacctg 120

gtctgggcgg agatcaccgg cggcccggtc cggcacggcc ggctggccgg cacctgcgac 180

gcgcagggcg tcgtgcgctt cgcctacctg gaggtgctca ccgacggcac catagtcatc 240

ggcgagtgcg agtcccggcc cgaacggctg ccggacggcc ggatccggct gcgggaacag 300

tggcgccggc acggaccacg ccaggacagc ggcgtctccg tcatcgagga ggcagtgccg 360

gcgctcgccg gaggacagga gagccggcgt cgtgtctga 399